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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

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THE IMPORTANCE OF MALACOLOGY IN HELMINTHOLOGY

By Charles Wilcocks, C.M.G., M.D., F.R.C.P., D.T.M. & H.
Director, Bureau of Hygiene and Tropical Diseases

Snails are important as the intermediate hosts of certain trematode parasites of man and animals. Knowledge of the biology of these snail hosts is essential to the proper understanding of the incidence and distribution of the diseases caused by these parasites, and prevention may depend on this knowledge, as in other diseases in which vector hosts play a part, and in which the study of the habits of such hosts has led to effective measures of control.

Experience with mosquitoes and other arthropods has shown that biological differences between species, and between races of the same species, are often linked with differences in capacity to acquire and transmit infection, and this fact has emphasized the importance of a close study of the anatomy and physiology of these vectors. Moreover, the unexpected by-products of pure research are often among the most fruitful in leading to practical results.

The classification of snails of medical and veterinary importance, especially the snails associated with schistosomiasis, has largely in the past been based on the appearances of the shells, and this system is more and more clearly breaking down, until at the present time the subject is in such a state of confusion that there is no certainty that two scientists using the same name are in fact referring to the same snail.

The confusion that may result from identifying snails by a system based on such taxonomic details is exemplified by comparing the statement appearing in most modern textbooks on tropical medicine (such as Manson's *Tropical Diseases*, 13th ed., 1950, pp. 957 and 960) that there are some 25 different species of snails in Africa transmitting schistosomiasis to man, with that of Amberson and Schwarz (whose paper is reviewed in this issue, below, p. 394) who state that they consider that not more than 4 species should be regarded as proved vectors in Africa.

Appreciation of this confusion is not new, it has been evident to many workers for several years. Schwetz, for instance, in a paper published in *Ann. Soc. Belge de Méd. Trop.*, 1949, v. 29, 37–65 [this *Bulletin*, 1949, v. 46, 1156], makes the point that experts at present may differ among themselves regarding the classification of a particular specimen or group of specimens, and he considers that the present system of classification is much

too artificial, and that it should be modified and simplified. In commenting on this paper Gordon [this *Bulletin*, 1949, v. 46, 1157] draws the distinction between the entomologist who bases his classification on the whole animal and the malacologist who is often asked to do so on the shell only.

Ranson (*Bull. Soc. Path. Exot.*, 1953, v. 46, 783) amplifies the point: the World Health Organization requested the Malacology Laboratory of the Paris Museum of Natural History to undertake the study and classification of the snail hosts of schistosomes, but the results of this study revealed the fact that the characteristics of the shells alone were insufficient for the purpose, and the request was made that other techniques, particularly in the anatomical field, should be added to bring to this study the necessary degree of precision. It is obviously a difficult subject.

The difficulty is not confined to the snails which carry *Schistosoma haematobium* or *S. mansoni*. Mao and Li (*J. Parasitology*, 1948, v. 34, 380 [this *Bulletin*, 1949, v. 46, 559]), after a study of the snail hosts of *S. japonicum*, conclude that the denticle count varies to such an extent that it is not a dependable criterion, and that the same is true for shell characters.

In the World Health Organization Technical Report Series No. 65, on bilharziasis, the suggestion is made (p. 18) by the Expert Committee on Bilharziasis that a sub-committee should be formed, consisting of 3 malacologists possessing a special knowledge of the snail hosts of human schistosomes, who should be prepared to undertake identification based on the internal anatomy of known, suspected or potential intermediate hosts. The regional priorities might be in the following order:—Africa, the Eastern Mediterranean, the Americas, the Western Pacific.

The point to which attention should be drawn in this suggestion is that identification should be based both on the internal anatomy of the snails, and on their shells; it may be added that physiological and biochemical studies might also be very much to the point.

It seems, however, that much preliminary study would be necessary before the members of this sub-committee could undertake any serious identification, and that a thorough study of these and allied snails would be needed to establish genera, species and possibly races. In such a study the ordinary techniques of zoological research must be used, and the only reasonable approach to the problem would be to study the snails primarily as snails, not as intermediate hosts of schistosomes. It would probably be useless to base their classification on anything but the most comprehensive criteria, and to do this implies a knowledge of snails in general which only a trained and experienced malacologist could be expected to possess. Modern taxonomy requires the closest collaboration between the museum worker, who has access to the essential reference collections and extensive library facilities, the field ecologist and the experimentalist.

The implication of all this is that malacology should be studied as a science in its own right, as a basis for the study of intermediate hosts of the trematodes which infect both man and animals; that this study must be placed on a long-term basis; that there should be provision for careers in malacology open to members of the staffs of universities or museums, or to Government scientists; and that they should be assured of continuous support in research which will certainly occupy their working lives and equally certainly be essential to the proper understanding and control of schistosomiasis and other important diseases due to trematodes. It is hardly necessary to add that these groups of diseases are so widespread that they already present a most formidable problem, which is likely to become more urgent as the diseases spread.

It is with great satisfaction that we learn that the authorities in Britain are alive to the importance of encouraging such investigations and that the British Museum, Natural History, and the Colonial Medical Research Committee are combining to assist in the training of young malacologists and in maintaining centres where such men's knowledge will be made available for the advancement of medical and veterinary research.

SUMMARY OF RECENT ABSTRACTS *

III. MALARIA †

[*Continued from p.* 247]

Treatment

A comprehensive account of modern research on, and the present status of, chemotherapy and prophylaxis of malaria has been given by Fairley (p. 83), who relates this work (in which he took a major part during the war of 1939–45) to the discoveries recently made on the life cycle of the parasites. The lecture should be read in full.

Covell (p. 1118) summarizes recent and current research on the treatment of malaria and on control by insecticides, giving a useful table of the action of the various drugs on the different stages of the parasites. Only the 8-aminoquinolines (pamaquin, primaquine, etc.) have an effective action on secondary tissue phases, but proguanil and pyrimethamine act on the primary tissue phase of *P. falciparum*. Raffaele (p. 477) also discusses the action of various drugs on the different stages of the common malaria parasites; he claims that mepacrine acts on secondary exo-erythrocytic forms of *P. falciparum*, but in comment Covell remarks that the usual opinion is that it acts on the young sexual forms. Goodwin (p. 377) has written a summary of the present position of chemotherapy in malaria and trypanosomiasis.

In a note on the treatment of malaria in Britain, Covell (p. 907) stresses the importance of using a powerful immediate schizonticidal drug (chloroquine, amodiaquine, mepacrine or quinine). He points out that the action of proguanil and pyrimethamine is relatively slow, and he does not advocate their use in acute malaria unless combined with a more rapidly acting drug, but recognizes their value in prophylaxis. In a controlled trial of several drugs on West African children with subclinical malaria (chiefly *P. falciparum*) Bruce-Chwatt and Archibald (p. 477) found that in the doses used chloroquine, amodiaquine (camoquin), azacrin (a new acridine compound) and pyrimethamine were all good schizonticides, and that there was little evidence of toxicity except that azacrin in a rather higher dose caused nausea, pain and vomiting in some children.

Carayon (p. 674) writes of the vascular, haemorrhagic and nerve accidents which may follow intragluteal injections of antimalarial drugs, and their

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* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on malaria in this series see the March and April issues of the *Tropical Diseases Bulletin* each year since 1939.

surgical treatment. Intramuscular injection of quinine should be abandoned except where vomiting prevents ingestion by mouth.

Hale and Halpenny (p. 906) found that in Canadian soldiers returned from Korea, many relapses of *P. vivax* infection occurred soon after suppressive proguanil was stopped, and that for treatment of actual attacks chloroquine alone was not nearly so effective as chloroquine with primaquine in preventing subsequent relapses.

Carrescia (p. 478) found chloroquine more effective than the acridine compounds in *P. vivax*, *P. malariae* and (one) *P. falciparum* infections in neurosyphilitic patients. Eckhard (p. 905) writes favourably of it in African infants with *P. falciparum* malaria, and Jelliffe (p. 792) used a single intramuscular injection (5 mgm. base per kgm.) with success in West African out-patient children in whom treatment otherwise would have been difficult. Mohr (p. 793) has used it intravenously (each dose being 0·5 gm.–10 ml. of a 5 per cent. solution, up to 3 doses) or intramuscularly (the same dose at intervals of 6–12 hours, to a total of 1·0 to 1·5 gm.), but advises that the intravenous method should be used only in grave cases. Knorr (p. 792) gives doses of 0·25 gm. intramuscularly or intravenously, but does not give details of total dosage. Intravenous injections must be given very slowly.

Coda (p. 794) reports the results of an extensive experience with amodiaquine and chloroquine in treatment.

Several authors have successfully used amodiaquine for single-dose treatment: Kalbian and Kalbian (p. 85) for *P. vivax* and *P. falciparum* in Arab refugees (dose 0·6 gm.); Love *et al.* (p. 378) in relapsing *P. vivax* malaria, stating that it was more effective than a 3-day course of chloroquine, though the latter drug is best for suppression; Laufer and Freedman (p. 478) in Africans with *P. falciparum* (0·6 gm.); and Copin *et al.* (p. 675) in soldiers from Indo-China with (mostly) *P. falciparum* (0·6 gm.).

Crowther and Levi (p. 485) have isolated a highly active metabolite of proguanil from faeces and urine of rabbits.

In a symposium on Daraprim (pyrimethamine) Boyd and other speakers (p. 85) described its action, and its effects in experimental and human malaria. It acts rather slowly in acute attacks, and its chief use may be as a suppressive. With the object of testing the theory that pyrimethamine might effect radical cure of *P. vivax* malaria by destroying late exo-erythrocytic forms of the parasite, Covell *et al.* (p. 1118) treated patients with the mosquito-induced disease, but found that relapses occurred in some, even after repeated administration. They also noted that the response was slow, and they do not advocate the drug for treatment of attacks of malaria in non-immune persons.

Boyd (p. 1118) points out that pyrimethamine, like proguanil, acts on the asexual forms of the parasite in the blood stream at the time of nuclear division, and that if it does act on the exo-erythrocytic forms it probably does so by interfering with nuclear division. It may be that an effective concentration is built up, if the drug is administered for 8–10 weeks, to affect the vulnerable stage of the early relapsing strains (as in Coatney's work) but the late relapsing strains (such as that used by Covell *et al.* above) remain latent for up to 40 weeks without indication of active division of the liver-cell forms, and pyrimethamine given during that period would have no effect.

Jaswant Singh *et al.* (p. 907) found that a single dose of 25 mgm. pyrimethamine cleared the blood of *P. vivax* in Indian patients. Jones (p. 186) has used pyrimethamine for the treatment of malaria in Africans, including 3 cases of cerebral malaria, by giving a single dose of 50 or 75

mgm. The results in most were satisfactory, but in one cerebral case the patient remained aphasic after parasitological recovery. In comment McRobert points out that oral administration of pyrimethamine should not be attempted in cerebral malaria in non-immune or unconscious Africans.

Malayan strains of *P. falciparum*, resistant to proguanil, were shown by Jones (p. 906) and Robertson *et al.* (p. 186) to be resistant to pyrimethamine also. Wilson and Edeson (p. 380), however, think that cross resistance with proguanil is unlikely. They do not consider pyrimethamine suitable for the treatment of acute malaria due to Malayan strains of *P. falciparum* and in India Chakravarty and Chaudhuri (p. 479) similarly do not regard it as suitable for *P. falciparum*, though effective against *P. vivax* and *P. malariae*.

In the *Journal of the American Medical Association* (p. 378) 4 reports on primaquine used in relapsing *P. vivax* malaria of Korean origin show that this drug was as effective as pamaquin in eradicating the tendency to relapse, but in smaller doses, and it was less toxic. Like other 8-aminoquinolines, it may produce haemolysis in dark-skinned races; it should not be given with mepacrine. Chakravarty and Chaudhuri (p. 794) make the point that the curative action of primaquine alone is slower than that of primaquine together with chloroquine or quinine.

Ruiz-Sánchez *et al.* (p. 380) have tried chloramphenicol in malaria, without much success. Cortisone had little effect in a few patients treated for *P. vivax* malaria in relapse (Wurl *et al.*, p. 87).

Drug Prophylaxis

Proguanil has been much used in prophylaxis. In Algerian children Lacroix *et al.* (p. 187) gave it once each week for more than 3 months in late summer, with success. In the non-African population of Lagos Nicol (p. 1006) regards 200 mgm. daily for persons over 10 years old (50 mgm. for babies under 1) as the most satisfactory prophylactic against *P. falciparum*. For mosquito-induced *P. falciparum* infection in non-immune or only slightly immune Africans Thomas *et al.* (p. 1120) found that doses as low as 0·1 gm. twice a week usually afforded good protection. Adhikari and Ganguli (p. 676) used it successfully in employees of an Indian railway. After several years of its use in Assam, Gilroy (p. 187) found that *P. falciparum* malaria in children showed considerable resistance to proguanil. Norman (p. 279) had a similar experience in Assam, but after investigation he concluded that this was the result of evasion of the drug by the people; this practical difficulty is important. Gunther and Wright (p. 908) in New Guinea, however, note that breakthrough apparently does occur in persons taking it regularly; but this does not detract from its value as a prophylactic.

Canet (p. 908), on the other hand, made an extensive comparison of the value of prophylaxis with proguanil and chloroquine in the same doses, in villages in Indo-China. He found that resistance to proguanil appeared, but not to chloroquine, and he suggests that proguanil is not suitable for such use.

After an extensive trial of several drugs in suppression of malaria in estate workers in Malaya, where transmission was light during the period of trial, Field *et al.* (p. 1120) conclude that chloroquine (0·25 gm. base once each week) was the most effective.

From experience in 2 cases Gunther (p. 793) suggests that chloroquine is concentrated in the liver and is not excreted in the milk in sufficient amount

to act as a suppressant for breast-fed infants, and also that dosage sufficient to suppress malaria is inadequate to prevent hepatic amoebiasis.

Tests in African children in the Belgian Congo indicate that for prophylaxis amodiaquine in a dose of 20 mgm. per kgm. twice weekly is more satisfactory than proguanil or mepacrine, and is equal to chloroquine. De Smet (p. 381), moreover, shows that 25 mgm. per kgm. once each month was effective, but the effect of a single dose of the other drugs once each month was not tested. In a group of Indian villages Chaudhuri and Chakravarty (p. 676) found that 0·4 gm. once a fortnight considerably reduced the incidence of malaria.

Pyrimethamine has been found satisfactory by Covell *et al.* (p. 795) in preventing malaria in non-immune persons subjected to bites of mosquitoes infected with *P. falciparum*. The dose was 25 mgm. once each week; it probably acts as a causal prophylactic. This method may be suitable for people under disciplinary control, but for others a daily dose of 5 mgm. is probably better, if the efficacy of this dose is confirmed by field trials. In Indo-China Canet and Farinaud (p. 278) found weekly doses of 100 mgm. very effective against *P. falciparum*, but Taylor (p. 1006) in Africa quotes 7 cases in Kenya in which pyrimethamine failed to protect, and also quotes a fatal case of poisoning in a child who swallowed 15 tablets.

Control

A booklet by Macdonald (p. 280) on malaria and its prevention, of considerable size and containing much detail and practical advice, has been revised and brought up to date. It is intended for planters and mine managers, but would be useful to a much wider public.

Pampana (p. 279) sums up modern methods of malaria control.

Insecticides

By means of a technique for applying insecticides directly to *A. quadrimaculatus* Ludvik (p. 1169) found that dieldrin, lindane, malathon and allethrin are considerably more toxic than DDT.

Tests of DDT, BHC and dieldrin have been conducted in Kenya against *A. gambiae* and *A. funestus* by Davidson (pp. 190, 1011) who found that all three have some irritant properties, but that the irritant properties of DDT continued for at least 9 months. BHC killed a proportion of the mosquitoes for 6 months, DDT for 7, and dieldrin killed many more for the 7 months of its trial. The conclusions are that DDT applied to the roof only is less effective than if applied to the whole house; fine crystals are better than coarse at first, but the coarse improve after a few months; DDT and BHC together combine the advantages of both but do not equal the performance of dieldrin. With Burnett, Davidson (p. 191) showed that mosquitoes in cages brought into treated rooms could be killed by insecticides without actual contact. With BHC this could be explained by fumigant action, but with DDT and dieldrin unfiltered air from treated rooms was much more lethal than filtered air, and it seems very probable, therefore, that air-borne particles were important.

In tests of DDT, BHC and dieldrin with *A. stephensi* and *A. gambiae*, Hadaway and Barlow (p. 1085) found that the irritating effect was most marked (as judged by time to first flight, after alighting on the sprayed surface) with freshly applied BHC, slightly less with DDT and much less with dieldrin. But whereas the death rate after DDT in the doses used was only 53–70 per cent., it was 100 per cent. with the other two. Vapour of gamma BHC, however, is lethal without being irritating.

Rajindar Pal *et al.* (p. 480) report laboratory tests of chlordane, aldrin and dieldrin against larvae of *A. stephensi* and *C. fatigans*, and some work on residual spray of houses with chlordane and dieldrin. Krusé *et al.* (p. 87) discuss the factors which should be borne in mind when insecticides are being evaluated against *Anopheles* larvae; for instance, numbers of larvae, volume of suspension, surface area, method of dispersion, etc.

Logan (p. 909) writes of the control of malaria undertaken in Sardinia in 1946–1950, where the attempted eradication of *A. maculipennis labranchiae* was not quite successful, though the incidence of malaria was reduced from 78,173 cases in 1944 to 9 in 1951. Both Perrini (p. 600) and Jerace (p. 600) write of the remarkably good results which have been achieved in Italy by the antimalarial measures taken in recent years. Malaria no longer exists in the Agro Romano, which is a matter of historical importance.

Insecticide campaigns have been carried out for several years in most malarious countries, and results are now being evaluated. In Greece the campaign has now been suspended in most areas, to be started again wherever serious breeding of anophelines takes place, though this has been necessary in only a few areas (Livadas, p. 909). There is some evidence that *A. sacharovi* shows considerable resistance to DDT (but in these areas there has been no reappearance of malaria) and Livadas and Georgopoulos (p. 1007) have demonstrated it in wild-caught specimens and in adults bred from larvae.

In Israel Saliternik (p. 1008) shows that DDT has almost eliminated the domestic species *A. sacharovi* in some areas, but the semi-domestic *A. sergenti* is not affected in the same way, and large-scale field work is necessary to control this and *A. superpictus*. As a measure of economy in Syria and Lebanon Gramiccia *et al.* (p. 1009) sprayed houses with DDT in strips 30 cm. wide, separated by untreated bands of the same width. The most important anophelines were *A. sacharovi* and *A. superpictus*. The authors were satisfied that this method was as effective as the normal spraying, but in comment Busvine states that the data were too inconclusive for this to have been proved.

In Algeria the use of residual insecticides has not completely displaced the use of larvicides, and Richou (p. 188) explains the methods employed for distributing DDT from aeroplanes and helicopters, and for using DDT smoke.

De Meira (p. 601) shows that a residual spray campaign with DDT and BHC has apparently eradicated *A. gambiae* and *Aëdes aegypti* from the island of Sal, Cape Verde Islands, where there is an international air port. Himpe and Pierquin (p. 9) tried control in the Belgian Congo by spraying with DDT (2 gm. per square metre) on 4 occasions at intervals of 3 months, but the results in terms of reduction in malaria were meagre; conditions for mosquito breeding were very abundant. A campaign of residual spray treatment with DDT of huts in part of the Belgian Congo, and of DDT larvicidal methods in swamps, succeeded in eliminating the vectors (*A. funestus* and *A. christyi*) from the hilly areas concerned, and in reducing the parasite index to about half. Jadin *et al.* (p. 189) report that over 55,000 huts were treated. Jadin (p. 479) continues an account of malaria control by DDT residual spray in part of the Belgian Congo where *A. funestus* was the chief vector; it has now completely disappeared from that district, though *A. gambiae* persists in reduced numbers. The breeding of *A. christyi* and *A. squamosus* was not interrupted. Parasite rates have fallen very markedly.

Dowling (p. 910) describes the residual spray campaign in Mauritius,

which eliminated *A. funestus* (the principal vector) and *Aëdes aegypti*. It did not eradicate *A. gambiae*, which here tends to haunt animal houses and is not a vigorous vector. At first both DDT and BHC were used, but later the BHC was discontinued. In Tananarive, Madagascar, the continued use of DDT and BHC has been followed by a great reduction in the general and the malaria death rates, and the previous seasonal peak of mortality has completely disappeared (Mercier, p. 677).

A DDT programme in Pakistan, reported in the *Pakistan Journal of Health* (p. 191) was successful in reducing the parasite and spleen rates, but slowly. Kala azar seems to have been controlled also. Hamid (p. 911) describes the antimalarial scheme for the Lahore area, which includes a combination of measures against larvae and adults. In the Punjab malaria is associated with irrigation and seasonal flooding. Control has been attempted by residual spray just before the transmission season (September to November). Rafi (p. 1012) makes the point that legislation is required to prevent householders from rubbing off the DDT or replastering the walls after spraying. Results are to be reported later.

The success of DDT against adults and larvae, and of proguanil as a prophylactic, has been demonstrated in connexion with the construction of a large hydro-electric station in a hyperendemic area of north India (Srivastava and Chand, p. 280). Malaria control in coal-mining areas of India has been attempted by residual insecticides and suppressive proguanil, 0·3 gm. each week, with some success but not to the point of elimination (Chowdhury, p. 1012). Srivastava (p. 1013) and Viswanathan (p. 1013) describe the malaria organizations of Uttar Pradesh and Bombay State, respectively. In part of India where *A. fluviatilis* is the vector, Subramanian and Vaid (p. 677) found that 2 applications of BHC in the malaria season in the doses used were insufficient to eliminate transmission, and it appears that dosage must be increased and more applications made.

In Indonesia a standard method has been evolved for the use of DDT spray once each year to control malaria carried by *A. sundaicus*, *A. aconitus* and *A. maculatus* (Soeparmo and Stoker, p. 382).

Chow (p. 382) describes the malaria situation in Formosa, and the organization developed to control it by treatment and by the use of DDT.

Herms (p. 462) describes the control of *A. freeborni* breeding in California rice fields by applying DDT wettable powder from aircraft. DDT and BHC are used in the United States for dusting cotton at certain seasons, and Love and Kartman (p. 1014) observed that this process had a profound effect on *A. quadrimaculatus*, killing them up to 500 yards from a cotton field. There seems to be no doubt that resistance to DDT has appeared in *A. quadrimaculatus* in the Tennessee Valley. Krusé *et al.* (p. 383) give details of the tests by which they have established this.

The Malaria Division of Trinidad and Tobago (p. 88) has carried out research on *A. aquasalis* in coastal swamps and pools and rivers, and on other anophelines, during 1951, and the point is made that rice cultivation involves no increased malaria hazard except where irrigation and drainage are inefficient. Control of Bromeliad malaria by manual removal of the major host plants, or by spraying with copper sulphate, is satisfactory. For other mosquitoes dieldrin has been tested as a larvicide; it is effective and has no action on growing rice. Work on permanent measures to control *A. aquasalis* was emphasized during the year.

In Panama DDT has been used for the control of malaria since 1944; *A. albimanus* is the vector. Trapido (p. 192) shows that at first there seemed to be a selective action on engorged anophelines, but this is no

longer the case. The response of the mosquitoes has changed, but the reason is not clear; more *A. albimanus* per house are taken per night than was the case soon after the campaign started, but DDT continues to maintain a marked reduction in the proportion which feed in dwellings, and the malaria rate remains very low.

A detailed report on the DDT and BHC spray campaign in French Guiana has been written by Floch (p. 9) who shows that it has been remarkably effective. The incidence of malaria has decreased by 95 per cent., and the numbers of *A. darlingi* have been very greatly reduced, though eradication is unlikely as it is a forest mosquito. This work is very similar to that done in British Guiana.

De Bustamante (p. 1014) gives an account of the malaria service of Brazil, and the chief vectors. Most of the rural populations are now protected with DDT, and the incidence of malaria has been reduced by more than 90 per cent. He (p. 89) makes the point that is now becoming clear in many areas, namely that although *A. darlingi* is a domesticated species in coastal areas, and can be controlled by DDT there, it is much less domesticated in the interior, where it shows a preference for animal blood, and is not particularly a house-haunter. Control by insecticide spray of houses, therefore, is not to be expected.

Rachou (p. 796) describes the habits of anophelines of the subgenus *Kerteszia* in Brazil, where control by DDT residual sprays and destruction of Bromeliads by application of copper sulphate is carried out.

Ejercito (p. 678) makes the point that in the control of malaria the proved methods of careful survey and control of breeding should not be abandoned, a conclusion with which Macdonald (in comment) agrees.

Plasmodia of Monkey Malaria, etc.

Jaswant Singh and his colleagues have done much work on monkey malaria. They (p. 10) describe a strain of *P. inui* isolated from a Malayan monkey, which is much more pathogenic than their own laboratory strain. They have worked on chemotherapy and (p. 185) report favourably on chloroquine in human and monkey malaria (*P. knowlesi*), and (p. 678) give their opinion that, of the antimalarials, only chloroquine and quinine should be given by the intravenous route. They (p. 281) found a strain of *P. knowlesi* which developed resistance to proguanil after treatment for a year during 7 passages, and incidentally became resistant to pyrimethamine and bromguanide. They also (p. 193) found that proguanil treatment greatly reduced the infectivity of *P. knowlesi* to mosquitoes, and they discuss the implication of this in relation to human malaria. These workers (p. 193) measured the minimum effective dose of pyrimethamine against a strain of *P. knowlesi*, but Fulton points out that this laboratory strain, passaged for many years by blood inoculation, is not typical, and causes only low mortality.

Schmidt *et al.* (pp. 480, 481) have tested pyrimethamine in monkey malaria, and by analogy think that its greatest usefulness in human malaria would be as a routine suppressive. Its action is rather slow, and it readily produces resistance, and these features seriously limit its usefulness in treatment of active infections. It is much more toxic to monkeys than to rats, and the authors think that there is a serious potential hazard to the human user.

Bück *et al.* (p. 602) describe 2 new plasmodia in a splenectomized lemur from Madagascar.

Garnham and Pick (p. 285) describe unusual forms of merocysts of *Hepatocystis kochi*.

Plasmodium berghei, etc.

Much work has been done on *P. berghei*. The literature on it has been summed up by Prieto Lorenzo (p. 1015), and a comprehensive bibliography has been compiled by Draper (p. 681). Coudert and Chastel (p. 678) studied it with the phase-contrast microscope; Fulton and Rimington (p. 1015) showed that its pigment, like that of other malaria parasites, is represented by haematin; and Kruszyński (p. 282) demonstrated by microchemical methods that it obtains calcium directly from the surrounding plasma, not from the host cell. *P. berghei* may survive freezing to −190°C. for 24 hours if then thawed rapidly (Vargues, p. 281), or to −70°C. for as long as 15 days (Levaditi, p. 10).

Hsu and Geiman (p. 90) have detected a synergic action between *P. berghei* and *Haemobartonella muris*.

The course of infection of various small rodents with *P. berghei* is described by Mercado and Coatney (p. 679). Satya Prakash *et al.* (p. 797) failed to infect certain animals with *P. berghei*, and conclude that in this respect it behaves more like the avian than the mammalian parasites.

A comprehensive account of *P. berghei* malaria in white rats is given by Fabiani and his colleagues (p. 283) who show that 42 per cent. of 239 infected rats died, at the height of parasitaemia. The disease may assume renal, icteric, haemoglobinuric and nervous forms, but in animals on a diet deficient in vitamin A it runs a benign course of short duration. In recovered rats the infection becomes latent; there are no spontaneous relapses. In the latent period the rats are resistant to reinfection and are in a state of premunition. These authors (p. 12) state that although they were able, by massive intracardiac and intraperitoneal inoculation, to suppress the incubation period in rats, they were much less successful with mice.

Ramakrishnan *et al.* (p. 90) describe latent infections induced in rats by intraperitoneal injection. Black (p. 284) shows that after intraperitoneal inoculation of infected blood the parasites may be absorbed into the blood stream within 1 minute, and most of the infected red cells are absorbed within 24 hours.

Vincke and Peeters (p. 796) infected various rodents intraperitoneally with sporozoites of *P. berghei* from *A. dureni*. In the course of this work they proved that parasites may be found in the blood, by subinoculation, on the second day though not detectable microscopically until the 5th day. In comment Garnham makes the point that this suggests that the pre-erythrocytic stage is of the avian rather than the mammalian type, cryptozoites being set free into the circulation about the 48th hour.

Fabiani *et al.* (pp. 482, 483) show that *P. berghei* has marked affinity for reticulocytes, and that parasitaemia increases proportionately when the number of reticulocytes is increased by injection of phenylhydrazine, or when immune rats are splenectomized with the result that there occurs an abnormal increase in reticulocytes due to reactivated *Bartonella* infection. Conversely, when a rise of reticulocytes is prevented by daily intraperitoneal injections of normal rat blood (or by X-rays, Singer, p. 679), the parasitaemia remains low.

Fabiani and Fulchiron (p. 11) have been able to demonstrate cross immunity between 2 strains of *P. berghei* in white rats.

The effect of diet on *P. berghei* infection has been investigated by Fabiani and Grellet (p. 12), who observed that deficiency of vitamin A did not aggravate it, but that the malaria aggravated the symptoms of the vitamin deficiency.

Maegraith *et al.* (p. 384) have observed that it is difficult to infect with *P. berghei* mice receiving a milk diet with small amounts of certain B vitamins and calcium pantothenate. This appears to be a suppressive rather than a curative effect, possibly (as suggested in an editorial comment in the same journal) due to absence from milk of some factor needed by the parasite. This point was taken up by Hawking (p. 1122), who argued that the effect might be due to paucity of *p*-aminobenzoic acid, and found, in fact, that addition of *p*-aminobenzoic acid to the milk diet caused the infection to pursue its usual course. Bray and Garnham (p. 1121) show that a milk diet had a suppressive effect on the parasitaemia of *P. cynomolgi* infection in monkeys, but that the pre-erythrocytic and sporogony stages proceeded normally.

Ramakrishnan (p. 1016) comments on spleen size in albino mice and rats after blood-induced *P. berghei* infections.

The blood sugar level in white rats infected with *P. berghei* falls steeply when parasitaemia is 50 per cent. or more (Mercado, p. 383). Vargues and Fabiani (p. 680) have studied the reticulo-endothelial index of Sandor, and euglobulin I^1, in relation to *P. berghei* infection.

The Thorn test (diminution of eosinophiles after injection of ACTH) is positive in the early and late stages, but not in middle stages, of *P. berghei* infection of white rats. Adrenalectomy in the early stage results in a low degree of parasitaemia (Fabiani and Izzo, pp. 679, 680).

Schneider *et al.* (p. 483) recognize the value of *P. berghei* as an agent for tests of antimalarial drugs, but it should be used in conjunction with *P. gallinaceum* and *P. relictum*, and Fabiani and Vérain (p. 680) stress the importance of using large inocula of *P. berghei*. Drug tests have shown that *P. berghei* is susceptible to pyrimethamine (Jaswant Singh *et al.*, p. 1015), and sulphadiazine, but much less so to quinine (Ramakrishnan *et al.*, p. 90), and Darrow *et al.* (p. 385) have found some prophylactic action in aureomycin and oxytetracycline, but little in chloramphenicol.

Various dyes, antibiotics and other substances were tested by Thurston (p. 912) for activity against *P. berghei*. She (p. 913) describes the morphological changes produced in this parasite by treatment with some of the orthodox antimalarial drugs.

Rodhain (p. 913) describes the action of *P. vinckei* on white mice and other animals, and transmission experiments with various mosquitoes; the parasite appears to be strictly adapted to *Anopheles dureni*.

A study of natural and induced infections of the lizard *Sceloporus undulatus undulatus* with *P. floridense* is reported by Goodwin and Stapleton (p. 13).

Plasmodia of Bird Malaria

Corradetti (p. 601) discusses the mechanisms of immunity (largely as a result of work on bird malaria), showing that the reactions differ in various species of *Plasmodium* and other parasites. There may be phagocytosis of the whole parasite with or without crisis, or phagocytosis of pigment only; infection may disappear completely but immunity may remain for some time, which is true immunity without premunition; there may be immunity against the exo-erythrocytic forms but not against the blood forms. He illustrates his thesis by reference to various parasites.

The characteristics of a strain of *P. gallinaceum* are described by Richeson *et al.* (p. 682). Anderson (p. 683) describes a method for continuous propagation of this species in chicken erythrocytes, and Dubin (p. 284) has cultivated exo-erythrocytic forms from sporozoites in tissue cultures of various chick embryo organs; all stages of development occurred

in macrophages, endothelial cells and fibroblasts, and cultures from macrophages inoculated into chicks produced parasites which went through a normal erythrocytic cycle.

Clarke (pp. 195, 196) uses radio-active phosphorus for determination of *P. gallinaceum* growth *in vitro*, and Lewert (pp. 197, 198) has investigated the nucleic acids of plasmodia and the phosphorus partition of cells infected with *P. gallinaceum*, and the nucleic acids and proteins in infected nucleated erythrocytes.

The infectivity of *P. gallinaceum* to mosquitoes has been studied. Eyles (p. 13) found that the susceptibility of races of *A. quadrimaculatus* varied very greatly, though this species was not in general as susceptible as *Aëdes aegypti*; *A. freeborni* was only slightly susceptible. He (p. 199) studied the factors in the blood of the vertebrate host which influence infection of the mosquito, finding that serum albumin is important for the growth and nutrition of the parasite after ingestion by the mosquito.

Terzian *et al.* (p. 797) show that when various antibiotics, vitamins and hormones are given to *Aëdes aegypti* 3 days before to 3 days after the blood meal, some of them increased its susceptibility to *P. gallinaceum* and some decreased it; various compounds appear to act in different ways on the factors concerned with susceptibility.

Weathersby (p. 605) inoculated sporozoites, oöcysts and gametocytes (in blood) of *P. gallinaceum* into the haemocoelom of mosquitoes, obtaining development of sporozoites in the salivary glands of species known to be susceptible. This is an alternative to the normal route of infection, which may prove useful in experimental work on susceptibility of insects to parasites.

Kuper and Pelc (p. 484) have used radio-active tracers in studies of the development of *P. gallinaceum* in *Aëdes aegypti*.

In fowls inoculated with brain tissue infected with *P. gallinaceum* Corradetti and Cavaceppi (p. 91) demonstrated the limited period of exo-erythrocytic schizogony in the brain (8–25 days after inoculation), and the apparent resistance of the endothelium to subsequent infection.

Huff (p. 604) showed that the usually accepted dimorphism into macro- and micro-merozoites is not tenable, since all sizes could be detected. It was impossible to decide what makes an exo-erythrocytic merozoite invade tissue or blood cells.

Grignaschi (p. 1016) has established that transmission of *P. gallinaceum* by inoculation of blood taken during the acute phase of the infection is effected by the erythrocytic forms of the donor which directly invade the red cells of the recipient, without establishing an exo-erythrocytic phase.

After phagocytosis by cells of the reticulo-endothelial system Alvarez (p. 12) found evidence to suggest that the parasites are killed or inactivated, possibly as a result of enzyme action.

Herbig-Sandreuter (p. 682) examined the effect of high altitude in the Alps on *P. gallinaceum* infection of fowls. There is a retarding or suppressing effect in birds brought to high altitude some days before parasitaemia is expected.

Jaswant Singh and his colleagues (p. 683) describe their method of screening antimalarial drugs against *P. gallinaceum*. In trials of prophylaxis against *P. gallinaceum* infection in fowls they (p. 386) found that quinine, mepacrine, amodiaquine and chloroquine had no causal prophylactic effect; pamaquin, primaquine, sulphadiazine, proguanil and bromguanide were very effective, and proguanil and pamaquin appeared to act synergically. Pyrimethamine was also effective.

Greenberg and Coatney (p. 484) show that in blood-induced *P. gallinaceum* infections in chicks, recognized antimalarial drugs would eradicate the infection if the infecting dose was not too big, but a heavy infecting dose could prevent eradication even by maximum tolerated doses of the drugs. They describe the course of the infection and note that the curative properties of drugs are in general related to suppressive activity. Some degree of reversal of the action of proguanil on *P. gallinaceum* can be brought about by *p*-aminobenzoic acid and a few other substances (Greenberg, p. 1122).

Rollo (p. 92) has been able slowly to render *P. gallinaceum* resistant to pyrimethamine by giving increasing doses during 42 passages, but he points out that since this development was slow, the use of the drug as a suppressant for human malaria is not likely to lead easily to resistance. *P. berghei* was rendered resistant more quickly, but by a different method.

McConnachie (p. 387) has investigated the action of a pteridine on *P. gallinaceum*. Bishop and McConnachie (p. 387) have studied the development of resistance to metachloridine in *P. gallinaceum*. Lapinone, a naphthoquinone, has been found by Ray *et al.* (p. 683) to have some action in prolonging the prepatent period of *P. gallinaceum* infection.

On analogy with the necklaces which some primitive peoples wear to protect themselves from various diseases, Baranger and Filer (p. 684) tested rings of various metals on chicks infected with *P. gallinaceum*, and claim that some of the metal rings decreased the parasitaemia and prolonged life.

Rodhain and Andrianne (p. 605) report 2 new infections of penguins (in the Antwerp zoological gardens) with *P. relictum*. Sergent and Sergent (p. 485) have studied the length of infection in birds inoculated with blood containing *P. relictum*, and the duration of resistance conferred by the attack, which may persist, as premunition, for several years. Hunninen (p. 685) has observed the development of oöcysts of *P. relictum* in various species of mosquitoes, and Clark and Ball (p. 385) have made a study of the free amino acids in the bodies of *Culex tarsalis* in connexion with an attempt to find a medium suitable for maintaining the stomach in a healthy state during attempted cultivation of oöcysts *in vitro*. The "sparing substance" in duck plasma and serum is identical with a substance which prevents agglutination of duck erythrocytes injected into chicks which have received the duck plasma or serum (Becker and Schwink, p. 603).

Draper (p. 798) has shown that there is a high degree of reciprocal immunity between races of *P. relictum*.

McGhee (p. 681) shows that erythrocytes of infant rats and mice are more susceptible than those of adult animals to *P. lophurae*; cells of man, guineapigs and sheep are refractory.

Cultivation of *P. hexamerium*, *P. cathemerium* and *P. relictum* is described by Manwell and Glenn (p. 685), who used the Harvard medium. Trager (p. 195) has previously succeeded in cultivating *P. lophurae in vitro* for short periods in the absence of red cells; he now shows that the addition of malate and coenzyme A to the medium improves the results.

Thompson *et al.* (p. 603) have devised a method for testing drugs against *P. lophurae*, and set out the results of tests of 49 substances, alone or in combination. The avian test is not encouraging, however, for the selection of 8-aminoquinolines with curative properties in *P. vivax* malaria, for there was poor correlation between results obtained in avian and human malaria. They (p. 912) also tested 101 compounds related to benzoic acid, of which

18 showed suppressive activity. Hewitt *et al.* (p. 91) found some activity in quinazolones similar to an alkaloid from *Hydrangea*. With phenylhydrazine hydrochloride there is only a small margin between the effective and lethal doses (Rigdon *et al.*, p. 386).

P. circumflexum has been found in a new avian host (the grackle) in Brazil (Paraense, p. 799).

Manwell *et al.* (p. 604) discuss the effect of certain recognized antimalarials on *P. hexamerium* infections in the duck; only quinacrine was really effective. *Charles Wilcocks*

MALARIA

Gramiccia, G. Endémie palustre au Liban. [**Endemic Malaria in Lebanon**] Reprinted from *Rev. Méd. Moyen-Orient.* 1953, No. 3, 293–309, 1 map.

This is a lecture delivered by a malariologist who is working for the World Health Organization. A WHO team, consisting of a malariologist, an entomologist and a sanitary engineer, has been carrying out a comprehensive survey of malaria in all parts of the Lebanon, elaborating a programme of effective and economic malaria control and training Lebanese personnel who will be able to carry on the work after the departure of the WHO mission.

There is at present relatively low malaria endemicity in nearly all parts of the Middle East. Lebanon has suffered no major outbreak since 1943–44 but this paper shows that malaria still exists in most parts of the country and given exceptional circumstances a severe outbreak might recur: the rural population during the years of minimum incidence has lost much of the resistance to infection it formerly possessed.

Eight species of *Anopheles* are found in Lebanon:—*sacharovi*, *superpictus*, *claviger*, *hyrcanus*, *sergenti*, *algeriensis*, *marteri* and *multicolor*. *A. sacharovi* and *A. superpictus* are important vectors: *A. claviger* is strongly suspect, and there is evidence that *A. hyrcanus* and *A. sergenti*, more especially the former, may transmit the disease.

DDT spraying appears to have effected a marked reduction in spleen and parasite rates in certain areas. In Akkar in the north of the coastal plain most of the houses are constructed without chimneys: a thin layer of soot gradually covers the sprayed walls of the room, thus reducing or eliminating the residual action of the insecticide.

In 2 areas an experiment was made by spraying the walls in horizontal strips, 30 cm. wide, separated one from another by untreated surfaces of the same width. This has effected an economy of 30 per cent. of the cost of spraying operations and has yielded as satisfactory results as those obtained by complete spraying.

A. sacharovi in the Lebanon breeds for the most part in fresh stagnant water and not in brackish water as it does in other countries of the Mediterranean littoral.

There are some villages in which indigenous cases of malaria occur and in which *A. claviger* is the only anopheline found. This species is rarely if ever found in houses: it may be found in numbers on the sides

of wells, in which it breeds, almost all the year round. It attacks man viciously.

This summary does small justice to a lecture which contains so much interesting information. *Norman White*

Gabaldon, A. Importancia de la mortalidad sin diagnóstico médico en los datos bioestadisticos referentes a la malaria en Venezuela. [**Importance of Medically Undiagnosed Deaths in relation to Malaria Vital Statistics in Venezuela**] *Bol. Oficina Sanitaria Panamericana.* 1953, July, v. 35, No. 1, 1–10, 3 figs. English summary.

International agreement stipulates that statistics regarding causes of death must be based on diagnoses contained in death certificates signed by the medical attendant of the deceased. All deaths the cause of which is not certified in this manner must be classified under " cause unknown ". In Venezuela more than half the people who die have not received qualified medical care in their final illnesses. A similar state of affairs exists in many other Latin American countries (and in very many other parts of the world). On the initiative of the author of this paper the XI Pan-American Sanitary Conference recommended that the administrations of those countries in the western hemisphere in which the number of doctors is insufficient to meet the needs of their rural populations should authorize lay registrars to classify deaths, according to information supplied by relatives of the deceased, as due to (a) fevers, (b) respiratory diseases, (c) diarrhoeas, (d) smallpox.

This procedure was adopted in Venezuela. Deaths ascribed to malaria by medical certificate and deaths ascribed to " fevers " in each of the years from 1940 to 1950 are tabulated. There is a significant parallelism between the two curves, indicating that information obtained by non-medical registrars in the way described is by no means valueless. *Norman White*

Sautet, J. L'indice de régression au cours de la lutte antipaludique. [**The Index of Regression in Antimalarial Work**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 510–14.

The author adverts once again to the hypothesis enunciated by him 20 years ago that the spontaneous regression of malaria in a locality may be due to a decreased aptitude of the parasite to form gametocytes. In support of his thesis he reports observations made during the course of a year and a half's antimalarial work in Guadeloupe. That country was divided into 3 zones characterized by severe, moderate and very slight malarial endemicity, respectively. Parasite and gametocyte indices of places in these 3 zones are given. The percentage of gametocyte carriers in relation to the total parasite carriers, the author's regression index, averages about 30 in the first zone, 10 in the second, and zero in the third zone. Other information culled from reports on malaria in Mauritius and French Guiana is also produced. In all antimalarial work much more attention than is given at present should be paid to *P. falciparum* gametocyte rates. (Difficulties in identifying gametocytes of *P. vivax* and *P. malariae* invalidate many reports relating to gametocyte rates of these species.)

In brief the author's contention is: the lower the regression index the less tendency is there for malaria to expand. High regression indices indicate high expansion tendency even if there has been a marked reduction in the over-all parasite rate, brought about by some measure of control. [See also this *Bulletin*, 1948, v. 45, 670.] *Norman White*

Risler, H. Das Gehörorgan der Männchen von *Anopheles stephensi* Liston (Culicidae). [**The Antenna of** *Anopheles stephensi* **and Its Auditory Functions**] Reprinted from *Zool. Jahrbücher* (Anatomie). 1953, v. 73, No. 1, 165–86, 19 figs.

This is a very detailed study of the antenna of the male of *Anopheles stephensi* in which particular attention is paid, by interpretation of serial sections in different planes, to fine structural details of Johnston's organ in the bulbous pedicel and of the flagellar segments. The paper is profusely illustrated with drawings and photographs and is commendable for two clear perspective drawings illustrating the relationship of the parts within the flagellar segments to Johnston's organ in the proximal pedicel. In conclusion, the auditory functions of the parts are discussed. *D. S. Bertram*

Venkat Rao, V. & Annaji Rao, A. V. **A Further Note on Gonotrophic Discordance in** *A. annularis*. [Abstract.] *Indian J. Malariology*. 1953, June, v. 7, No. 2, 221.

"In discussing the phenomenon of 'Gonotrophic discordance' described by the senior author (Venkat Rao, 1947), Muirhead-Thomson (1951) observed that it should have been ascertained whether the wild caught female Anopheles used in these experiments were fertilized or not as *A. annularis*, in particular, is one of those anophelines in which the development of ovaries after a blood meal takes place irrespective of fertilization.

"This criticism was recognised as valid but, owing to the absence of the senior author in Burma, he requested the junior author to carry out further observations in *annularis* to clarify the issue.

"Accordingly, a number of *annularis* ♀♀ showing evidence of gonotrophic discordance were collected from the Khurda Road area of Orissa for these observations. Out of them, 34 survived to oviposit and their eggs hatched as larvae in about the normal time, indicating fertilization in every case." [See also this *Bulletin*, 1948, v. 45, 137.]

Kartman, L. **Comparative Susceptibility of** *Anopheles quadrimaculatus* **"Strains" to Domestic** *Plasmodium vivax*. [Research Notes.] *J. Parasitology*. 1953, Dec., v. 39, No. 6, 668–9.

The well-known differences in malaria incidence in the delta and rice-growing regions of Arkansas have created speculation regarding possible physiological variations in *Anopheles quadrimaculatus* in these 2 areas. The author quotes the work of Barber *et al.* nearly 30 years ago (*Pub. Health Reports*, 1926, v. 41, 2527): they concluded, from infection experiments, that *A. quadrimaculatus* from rice fields was susceptible to human malaria parasites.

In the present work, the author collected "strains" of *A. quadrimaculatus* in the Mississippi delta at Helena, Arkansas, and from rice fields at Stuttgart, Arkansas. These were compared with the laboratory strain Q-1, to determine susceptibility to St. Elizabeth strain *P. vivax*. The results are shown below:

Mosquito "Strain"	Mosquitoes Dissected	Infected	Per cent. infected
Q-1	96	75	78
Delta	71	53	75
Rice field	62	48	77

It would seem that all 3 " strains " were equally susceptible to domestic *P. vivax* and this was in fact supported by the comparative intensities of oöcysts. Such a situation would substantiate the view of Barber *et al.* that the comparative freedom from malaria formerly experienced in the Arkansas rice fields (when incidence was high in the delta area) was due more to human than to mosquito factors. *H. J. O'D. Burke-Gaffney*

Bami, H. L. **Recent Advances in Synthetic Antimalarials 1948–1952.** *Indian J. Malariology.* 1953, June, v. 7, No. 2, 183–219. [Numerous refs.]

Chaudhuri, R. N. & Dutta, B. N. **Chemotherapy of Malaria with special reference to the Work Done in India.** (A Review.) *Indian Med. Gaz.* 1953, Jan., v. 88, No. 1, 1–19. [Numerous refs.]

Khan, N. **Resochin in Malaria.** *Indian Med. Gaz.* 1953, Feb., v. 88, No. 2, 57–8. [11 refs.]

" Trial of Resochin on 36 patients of malaria is described and satisfactory results are reported with 1·5 gm. of Resochin in 3 divided doses for 2 days. Comparison with Mepacrine and Camoquin revealed Resochin to be better than Mepacrine and of pretty nearly the same efficiency as Camoquin."

Perroni, G. B. Sulla terapia della malaria nei cardiopatici (effetti sull'apparato cardiovascolare di un nuovo antimalarico sintetico). [**Malaria Therapy of Patients with Heart Disease: the Effects of Proguanil on the Cardiovascular System**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953. Aug., v. 34, No. 8, 389–407, 10 figs. [52 refs.] English summary (9 lines).

The observations described were designed to determine what collateral effects, if any, on the cardiovascular system might be caused by the administration of proguanil in therapeutic doses. Of the 30 persons subjected to the investigation some were healthy, some had cardiac lesions with or without circulatory disturbance, some were infected with malaria. No harmful effects were noted in any of these cases and the conclusion is reached that proguanil is the drug of choice for the treatment of malaria in patients suffering from cardiovascular diseases. *Norman White*

Norman, T. **Proguanil-Resistant *falciparum* Malaria.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1953, Nov., v. 1, No. 6, 177.

During a serious outbreak of *P. falciparum* malaria in a tea garden in Assam in 1953, the author studied the question of proguanil resistance in 33 moderately ill adult patients. After the first blood smear was taken, each patient received 300 mgm. of proguanil: this dose and the blood smear were repeated every 24 hours for 96 hours. In 8 cases, the attack had to be terminated with quinine within the period of 96 hours.

A table shows that the numbers of patients having no parasitaemia within 24, 48, 72 and 96 hours were 6, 4, 5 and 8 respectively: these included the 8 patients to whom quinine had eventually to be given. The number of patients still showing parasitaemia after 96 hours was 10. While proguanil-resistance was evident in nearly one-third of those treated, the author admits the objection that the drug may not actually have been swallowed: but he adds that the tea garden labourer is usually only too glad to take curative measures, even though he may not show this attitude

to prophylactic drugs, as the author found in a recent study [this *Bulletin*, 1953, v. 50, 279]. *H. J. O'D. Burke-Gaffney*

Belios, G. D. [**Summary Malaria Control Work carried out up to Date in Greece and Programme for 1953**] *Arch. Hyg.* Athens. 1953, Jan.–Mar., v. 3, Nos. 1/3, 5–21, 4 charts & 1 folding map. [10 refs.] [In Greek.] English summary 106–7.

From 1946–1950, DDT was employed as a residual spray in malarious villages in Greece, averaging 5,067 houses per annum with a population of nearly 3½ million. In urban areas, DDT as a 0·1 per cent. emulsion applied at 0·02 gm. per square metre was used as a larvicide and this gave protection to another 1½ million per year.

The results were very satisfactory: the mean parasite index of children of school age fell from 16·4 per cent. to "1/300th this figure". The estimated number of cases of malaria fell from 1,000,000 to less than 10,000 a year, and other insect-borne diseases were strikingly reduced.

In 1951, the programme was modified by some general reduction in house spraying and by its replacement in 2 regions in the south (Crete and Peloponnese) by systematic epidemiological surveillance. The results were quite comparable with those of the previous 5-year period.

In 1952, the system of surveillance was extended to the whole country and 27,983 visits were made in the villages and 7,534 blood films taken; there were 408 positive smears, from 173 places mostly in the west and north of Greece. The results are shown in figures in the original paper (which is written in Greek) and which also includes a map indicating the infected areas. Most of the infections in 1952 were caused by *P. vivax* (83 per cent.) with 12 per cent. *P. falciparum* and 3 per cent. *P. malariae*. They occurred either as isolated cases or in minor outbreaks, corresponding to their topographical distribution. No clear-cut association with rice cultivation was shown. House spraying was continued "suppressively" in the infected villages. In general, the results in 1952 were as good as those of previous years.

The second part of the paper outlines a suggested programme for 1953 based on the findings described above, with provision for DDT-resistance by the use of other insecticides where necessary. *H. J. O'D. Burke-Gaffney*

Colless, D. H. **The Effect of DDT and Kerosene upon Adult Behaviour in *Anopheles balabacensis* Baisas** (= *A. leucosphyrus* Auct.). *Ann. Trop. Med. & Parasit.* 1953, Oct., v. 47, No. 3, 261–71, 13 figs.

Though *A. balabacensis* is not a domestic mosquito, it will bite indoors at night, and about 80 per cent. have been observed to rest on walls for 10–20 minutes before feeding and almost all rested for a longer period (30–60 minutes) afterwards. This suggests that residual insecticides may effectively reduce malaria transmitted by this mosquito, provided that the wall contacts are sufficient to pick up lethal doses of insecticides.

It was decided to investigate the effects of DDT residues on the behaviour of *A. balabacensis* in houses on Labuan Island, North Borneo. In the first series of tests, a hut was lined with wooden squares alternately painted with 5 per cent. DDT in kerosene, kerosene alone, or left untreated. The painted panels were 70 sq. in. in area while the controls, which were twice as numerous, were 35 sq. in. At intervals from 1 to 4 months after treatment, and again during the 6th month, a man slept in the hut, while 2 observers with dim flash lamps studied the behaviour of any mosquitoes which entered.

It was found that, during the first month after treatment, few mosquitoes would rest at all, either before or after feeding: indeed, many left at once without feeding. With the lapse of time, more resting occurred, until the numbers were about normal in the 4th month.

As regards individual panels, contacts of ½ minute or more on DDT were clearly reduced up to about 3 months. Contacts with kerosene were somewhat lower than controls in the second month but were substantially higher in months 3 and 4.

Observation on the behaviour of individuals suggested that, in months 2 and 3, mosquitoes tended to move away from DDT and kerosene and remain on untreated squares. The average resting time on DDT was 1 minute in the 1st month, gradually increasing up to 10·4 in the 4th and 29·4 in the 6th. On kerosene the corresponding figures were 3·8 in the first, increasing to 28·6 in the 4th and 34·8 in the 6th. These increases could be explained by decline in the effect of the treatments; but there was also an increase in the resting time on controls (8 minutes 1st month to 43·5 minutes in the 6th month).

Records were made of feeding times, throughout the night, in the course of this experiment and compared with observations on untreated buildings. In the latter, the peak feeding time appears to be in the middle of the night. But in the house containing the treated panels, 2 peaks were evident during months 1 to 4; the first at 10–11 p.m. and the second 4–5 a.m.

A second experiment was attempted with the hut sprayed with DDT suspension (250–300 mgm. per sq. ft.) but this coincided with a sudden reduction in mosquito population and it was abandoned after a month. The behaviour of only 26 mosquitoes was observed, but there were clear indications of abnormality. Some 20 per cent. of them left without feeding and of those which fed only half (11 out of 21) rested subsequently.

J. R. Busvine

British Guiana. **Medical Department. Mosquito Control Service Annual Report 1952** [Charles, L. J., Chief Officer]. 18 mimeographed pp. 1953. Georgetown: "Daily Chronicle" Ltd., 23, Main Street.

The Mosquito Control Service establishment comprised 73 persons, 4 on administrative, 4 on supervisory, 2 on laboratory and 63 on field duties.

It is of interest to note the comparative cost of one gallon of 3 different DDT formulations, each of 5 per cent. strength: DDT-kerosene solution, DDT wettable powder suspension, and DDT-xylol emulsion cost respectively 0·82, 0·60 and 0·56 British West Indian dollars. Increased resistance by householders to the use of the "streaky" wettable suspensions was encountered. The emulsion is therefore favoured for general use and a 40 per cent. emulsion concentrate of DDT is prepared centrally; xylol is the solvent and Triton X-100 the detergent. In 1953 Shell Supona D formulation was introduced.

The strategic malaria control as practised by the joint action of the Government Service and British Guiana Sugar Producers' Association and other agencies afforded protection for more than 99 per cent. of the Colony's population. It is the policy of the Control Service to extend activities to the remoter, sparsely populated areas; such work re-emphasizes the close relationship existing between *Anopheles darlingi* and man and the essential need of insecticides; the main difficulty is transportation. In 1952 the premises sprayed numbered 27,256, the residents in these premises 111,114, the average cost per house 1.86 dollars and the cost per person 0.55 dollar; the equivalents in United States dollars would be 1.08 and 0.32. The

incidence of malaria is now so small that the Central Board of Health has included malaria as a notifiable disease involving the payment of a one dollar fee to the doctor for each notification confirmed microscopically: only 181 cases were notified in 1952. Of 4,299 blood smears examined by various laboratories 67 (1·6 per cent.) were positive, 58 *Plasmodium falciparum* and 9 *P. vivax*. The following contrasting vital statistics are well worth noting:

	Malaria Rates per 100,000				
	Morbidity	*Mortality*	*Birth Rate*	*Crude Death Rate*	*Infant Mortality Rate*
1943	94·5	2·71	33·5	24·7	141
1952	0·4	0·04	44·3	13·5	82

Mosquitoes

Mosquito survey by hand and "flit" catches continues as a routine. The average number per house in 4,373 houses examined was 20·2 by "flit" catches and 4·8 in 15,563 houses examined by hand catches; 98 per cent. were *Culex fatigans*, and 1·05 per cent. *Aëdes taeniorhynchus*. *A. aquasalis*, the only anopheline of any consequence, showed the low percentage of 0·41.

Larval collections in the coastal areas were negative for *A. darlingi*, and in 11,760 observations there were 2,151 foci of *A. aquasalis* and 1,120 of *A. albitarsis*.

The DDT programme has now no sustained effect against *C. fatigans* and antilarval measures are in process of field investigation.

Yellow Fever

No case was reported during 1952. Immunity surveys were carried out among the Amerindian peoples living interior to the coastal belt; of 40 persons examined in these areas 6 (15 per cent.) were positive. Inspection of premises for *Aëdes aegypti* is a routine measure; 29 of 47,610 premises were positive as were 38 of 314,402 water containers examined. Of 160 ships arriving at Georgetown, which were inspected, 26 had foci.

Despite the efforts of the Control Service mosquitoes continue to be a plague around Georgetown and in the villages; the *Aëdes taeniorhynchus* problem in the coastlands is immense and no reasonable control measures can be recommended; the *C. fatigans* problem would be easier to solve. It is not surprising in these circumstances that popular unfavourable criticism is directed against the Mosquito Control Service. *R. Ford Tredre*

Floch, H. Lutte antipaludique et lutte antiamarile en Guyane française. La quatrième campagne de dédétisation. Le paludisme en 1951. Action des campagnes antipaludiques sur les indices paludéens, l'indice vital, l'anophélisme et l'indice stégomyien. [**Antimalaria and Anti-Yellow-Fever Campaign in French Guiana. The Fourth DDT Spraying Campaign. Malaria in 1951. The Effect of the Campaigns on the Malaria Indices, the Vital Index, Anophelism and the *Aëdes* Index**] *Arch. Inst. Pasteur de la Guyane Française et du Territoire de l'Inini. Publication No. 282.* 1953, 72 pp., 5 figs. [26 refs.]

The fourth DDT spraying campaign carried out in 1951–52 in French Guiana, like its predecessor, covered all the inhabited regions of the coast and of the interior. As before both 5 per cent. DDT in kerosene solution and 50 per cent. wettable DDT powder in 5 per cent. watery suspension

were used. Benzene hexachloride in watery suspension was used in outhouses, stables, etc.

There was a marked reduction in malaria morbidity in 1951. The examination of 4,004 blood slides for parasites yielded positive results in only 1·5 per cent. as compared with 8·6, 21, 24 and 26 per cent. respectively in the four previous years. The few positive films that were found were all in the dry season July to October. Future DDT campaigns are to begin at the beginning of June instead of the 1st of August as in the past. Of the 56 positive films, *P. falciparum* was found in 50, *P. vivax* in 6. Malaria has become so rare that suppressive medication is no longer used. In the Jean-Martial hospital the total days of hospitalization for malaria in 1951 were only 917 compared with a mean of 8,249 for the years 1945–49: in only 16 of the 42 admissions for malaria in 1951 was the diagnosis confirmed microscopically.

In 1951–52 the spleen index of 3,663 schoolchildren in various parts of the country had fallen from 17 to 2·2 per cent., the parasite index from 10 to 0·3 per cent., the gametocyte index was practically nil, and the endemic index of Ross had fallen from 26 to 2·5.

Anopheles darlingi was not found once in 1951: more than 47,000 mosquitoes were captured and identified. *A. darlingi* was formerly excessively prevalent and much the most important vector. *A. aquasalis* remained very prevalent: DDT spraying of houses is inoperative against this species.

For the first time in French Guiana the birth rate exceeded the death rate.

Aëdes aegypti was not found in 1951. Jungle yellow fever is widely distributed in French Guiana. Positive serum reactions were found in children of 5, 7 and 9 years of age. Positive serum reactions are given by 17 per cent. of the inhabitants of the coastal zone and by 37 per cent. of the inhabitants of the interior.

The houseflies of French Guiana do not appear to have developed DDT resistance: the local housefly is *Musca domestica vicina*, not *Musca domestica domestica*.

The chigoe flea, *Tunga penetrans*, has practically disappeared from places treated with DDT. *Norman White*

Unti, O. & Coda, D. Luta contra os transmissores da malária no Estado de São Paulo—1952. [**Campaign against Malaria Vectors in the State of São Paulo**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Dec., v. 17, No. 54, 553–8.

A description is given of the Malaria Prevention Service of the State of São Paulo and the elaborate organization it has set up to meet the needs of its vast territory. In each of the 11 provinces (*regiões*) into which the State is divided there is an antimalaria post under the direction of a medical officer, which is responsible for coordinating and directing antimalaria activity in its area. There are in addition 37 sub-posts. In case of necessity further assistance is given by 125 health centres of the health administration.

Recent years have seen a remarkable decline in malaria prevalence in the State. In 1950, 4,355 primary cases of malaria were registered as compared with 12,859 in 1945: both these were cyclical years of maximum malaria prevalence. DDT spraying was first used in 1946 and has since been used on a very large scale. It is not easy, however, to evaluate the rôle played by DDT in the very remarkable overall decline in malaria morbidity. In the coastal provinces in which either *A. tarsimaculatus* or

A. albitarsis is the chief vector, DDT spraying has given excellent results. In the southern coastal provinces where *A.* (*K.*) *cruzii* or *A.* (*K.*) *bellator* are responsible for transmission the results of spraying have been capricious and mostly disappointing. In the extensive areas in which *A. darlingi* is the chief vector the results of DDT spraying have been very discordant. In some places excellent results seem to have been obtained: in others no decline in malaria incidence has resulted; in still others malaria incidence has declined remarkably though no DDT spraying has been done. The factors responsible for this apparently spontaneous decline are not apparent.

Recently the control of Chagas's disease and scorpions has been added to the responsibilities of the Malaria Prevention Service. In places in which both malaria and Chagas's disease occur a mixture of DDT and BHC is used as a spray: where Chagas's disease occurs with no malaria BHC alone is used. DDT alone is used where malaria is the only disease to combat.

It is reported that BHC residual spraying is efficient against scorpions.

Norman White

Greenberg, J., Nadel, E. M. & Coatney, G. R. **The Influence of Strain, Sex and Age of Mice on Infection with** *Plasmodium berghei*. *J. Infect. Dis.* 1953, July–Aug., v. 93, No. 1, 96–100, 2 figs. [10 refs.]

The authors record the results of a study on the course of infection with *Plasmodium berghei* in 184 mice belonging to 2 inbred strains and their hybrids, which were used in the hope of throwing light on the effect of different genetic factors on the host-parasite relations. While in one of the inbred strains the mice reacted to the infection like the ordinary (non-inbred) laboratory mouse, with a mean survival of 9·9 days, in the other strain they lived on the average 15·9 days, whereas their hybrids survived on the average for 20·5 days and were able to support a higher parasitaemia than either of the parent strains. There was also a difference in the response of the two sexes, female mice of the same strain surviving longer than the males. As regards the effect of age, the survival rate increased with the age of the animals.

C. A. Hoare

Vincke, I. H., Peeters, E. M. E. & Frankie, G. Evolution du *Plasmodium berghei* et *vinckei* chez différents mammifères. [**Development of** *Plasmodium berghei* **and** *P. vinckei* **in Different Mammals**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 269–82. [23 refs.]

The authors have arranged various mammalian hosts susceptible to *Plasmodium berghei* and *P. vinckei*—as reported in the literature and on the basis of their own recent observations—according to the course of the infection.

The first type comprises the following animals, in which the infection with *P. berghei* is invariably mortal: *Mus musculus* (wild and albino house mouse), *M. m. spretus* (mouse), *Mesocricetus auratus* (golden hamster), *Saccostomus campestris* (pouched rat), *Rattus* (*Mastomys*) *coucha* (rat).

In the second type are animals in which the infection is acute, and the issue may or may not be fatal; in the latter case the parasites persist for a long time without relapsing: *P. berghei* in *Thamnomys* [*Grammomys*] *surdaster* (tree rat: natural host), *Rattus rattus* (black rat), *R. norvegicus* (albino rat), *Praomys jacksoni* (African rat), *Tatera brantsi* (gerbil), *Meriones shawi* (gerbil), *Dipodillus campestris* (gerbil), *Aethomys* sp.

(murine), *Sciurus palmarum* (squirrel), *Microtus guntheri* (vole), *Sigmodon hispidus* (cotton rat), *Roussettus leachii* (bat); *P. vinckei* in white mouse.

The third type is characterized by a fatal or non-fatal infection followed by latency, with acute relapses: *Cricetomys ansorgei* (pouched rat).

The remaining animals are susceptible to *P. berghei* but the number of observations on the course of the infection is not sufficient for classification in any of the foregoing groups: *Lophuromys aquilus* (murine), *Steatomys pratensis* (fat mouse), *Leggada bella* (mouse), *Pelomys frater* (murine), *Acomys selousi* (spiny mouse), *Dasymys bentleyi* (shaggy-haired rat), *Claviglis murinus* (dormouse).

A detailed account, with numerous references, is given of the peculiarities of the infection in most of the hosts named. [However, it is not clearly indicated which of the infections are due to *P. berghei* and which to *P. vinckei*.] *C. A. Hoare*

Ryley, J. F. **The Mode of Action of Proguanil and Related Antimalarial Drugs.** *Brit. J. Pharmacol. & Chemotherapy.* 1953, Dec., v. 8, No. 4, 424–30, 1 fig. [16 refs.]

It was shown by Falco *et al.* [this *Bulletin*, 1949, v. 46, 1125] that 2 : 4-diaminopyrimidines, which had a formal resemblance to proguanil, antagonized pterolyglutamic acid (folic acid) and the observation led to the synthesis of pyrimethamine (Daraprim), an active antimalarial. A metabolite of proguanil with increased activity was isolated by Carrington *et al.* [this *Bulletin*, 1952, v. 49, 362] and resembled structurally pyrimethamine. The present investigation was undertaken to obtain information on the mode of action of proguanil and its reaction in regard to pterolyglutamic acid and related substances, which could be postulated in view of the above findings.

Lactobacillus casei was cultured in medium composed of tryptic digest of casein, plus inorganic salts, glucose and growth factors including folic acid, the latter in concentration ranging from 4·4 μgm. per ml. to 1 millionth of this quantity. The tubes with medium were autoclaved, and drug solutions which had been Seitz-filtered were added in 0·5 ml. quantities. A dilute suspension of 0·5 ml. of bacteria was then added and incubation was carried out at 37°C. in an atmosphere of 5 per cent. CO_2 and 95 per cent. N_2. Growth was estimated by measuring light absorption in a 0·5 cm. cell and curves were obtained correlating growth with concentrations of pterolyglutamic acid in presence or absence of drug.

A normal strain of *P. gallinaceum* and one resistant to proguanil were also used and the effects of antimalarial drugs on them was studied in a simple apparatus devised by D. G. Davey. Incubation was carried out at 38°C. for 24 to 40 hours in a medium containing chicken serum salts and glucose, mixing being effected by bubbling through it a gas mixture containing 5 per cent. CO_2 and 95 per cent. N_2 at *p*H 7·4. The growth factors or drugs whose effect was to be studied were added in Riger-glucose-bicarbonate solution. The effect which added substances had on the parasites was investigated by inoculating fresh chickens before and after incubation of *P. gallinaceum* and studying the subsequent course of the infection. By this means an idea of survival rate was obtained from the increase in the prepatent period [see Taylor *et al.*, this *Bulletin*, 1951, v. 48, 873]. It was found that about 10 per cent. of parasites were able to survive for at least 40 hours, and about 40 per cent. for 24 hours.

Whereas the effect of drugs against bacteria could be overcome by pterolyglutamic acid or thymine, a similar reversal was not observed in the case

of malaria parasites. It therefore seems to the author that the parasites cannot use folic acid as such, and purines and pyrimidines must be in the form of nucleosides or nucleotides for incorporation into parasite nucleic acid.

Other conclusions arrived at from experimental data were that the metabolite of proguanil, the analogous dichloro compound and pyrimethamine but not proguanil or its dichloro analogue, antagonize folic acid and thymine in *L. casei* cultures. From examination of stained slides it appeared that proguanil interfered *in vivo* with formation of chromatin and inhibited nuclear division of *P. gallinaceum*. A strain of this parasite made resistant to proguanil *in vivo* retained its character against the parent drug and others *in vitro*. There was no antagonism *in vitro* by folic acid or thymine to the antimalarial effect of the drugs tested. *J. D. Fulton*

Coatney, G. R., Cooper, W. C., Eddy, N. B. & Greenberg, J. **Survey of Antimalarial Agents. Chemotherapy of** *Plasmodium gallinaceum* **Infections; Toxicity; Correlation of Structure and Action.** *Pub. Health Service Publication No. 193. Pub. Health Monograph No. 9.* Wash. 1953, Jan., pp. viii + 322. [56 refs.]

During the last 12 years the authors, whose work in this field is well known, have screened approximately 4,000 substances for antimalarial activity against *P. gallinaceum*. The compounds have been arranged in this monograph with reference to their chemical constitution in order to evaluate as far as possible any correlation between activity and structure. Reports on the clinical activity of some of the substances have been described as indicated in an appendix and information concerning others has already been given by Wiselogle [this *Bulletin*, 1947, v. 44, 1106].

Chapter I is devoted to procedure, and determination of the tolerated dose of drugs in groups of 3 to 5 normal chicks, aged 6 or 7 days, of weight not less than 40 gm., is described. The substances under test were administered by mouth twice daily for 4 days. The maximum tolerated dose was the greatest amount of drug given under these conditions which allowed chicks to survive the course without loss of weight. The fully tolerated dose was that which allowed birds to gain weight at the same rate as controls during the period of drug administration.

In tests for antimalarial action, intravenous inoculation of 0·1 ml. of heparinized or oxalated blood containing 16 million parasitized red cells was used. The treatment pattern was the same as above and was initiated about 5 hours before inoculation. Groups of 5 chicks were used according to drug regimen, to a total of 50–120 birds in one test. A start was generally made with the fully tolerated dose so that activity could be more easily detected. The criterion of activity used was the number of parasitized cells present in stained smears on the day after the end of treatment. The MED (Minimal Effective Dose) was defined as the lowest amount of drug which caused reduction in parasitaemia to 25 per cent. or less of that in controls. In the case of quinine used as standard, this MED was approximately 0·016 mgm. base per gm. Since death occurred in over 99 per cent. of untreated birds, survival was used as criterion for cure.

In prophylactic tests bites by infected *Aëdes aegypti* or sporozoite inoculations were used to produce infection. Drug treatment was given as described above starting 5 or 6 hours before inoculation, and stained films of blood were examined from the 8th to 34th day in order to assess the degree of protection afforded. In this case sulphadiazine, the first drug described

as having prophylactic activity in this infection, was used as standard [Coggeshall *et al.*, this *Bulletin*, 1945, v. 42, 699].

The largest group of compounds tested was that containing the phenanthrene nucleus. Some simple amino alcohols of this series showed therapeutic activity equal to quinine in blood induced infections. None of the phenanthrene derivatives acted as true prophylactics and only one as a partial prophylactic. In Chapter III, naphthalene derivatives are described, mostly of amino alcohol type. They were not as active as the corresponding phenanthrene derivatives, only 2 of this series being as effective as quinine, and one substance acted as a true causal prophylactic. The following chapter on acridine derivatives describes 108 compounds tested which were either amino or amino alcohol derivatives. The effect of introduction of halogens and wide variation in position and nature of side chains was studied. Eleven substances were as active as quinine therapeutically, but none showed prophylactic activity. Chapter V is devoted to 8-aminoquinolines, and it was found that a wide range of biological activity occurred in this series, which includes pamaquin, pentaquine, and isopentaquine. Therapeutically, some derivatives had activity far in excess of quinine but none exhibited true prophylactic effect. As in the case of the 8-aminoquinolines it was found difficult to evaluate the change in biological response with structures in the 4-amino derivatives, the group which includes chloroquine, sontoquine and oxychloroquine. The introduction of a halogen atom in position 7 increased to the greatest degree antimalarial activity as well as toxicity. Therapeutic activity was possessed by many compounds, but none showed prophylactic activity.

Other quinoline compounds with amino alcohol groupings were also investigated on account of similarity to quinine. Fifty-five of these substances equalled or exceeded the therapeutic activity of quinine and one substance acted as a true causal prophylactic. Large numbers of benzene derivatives with varied substituents were investigated. None of the amino alcohols described in Chapter VIII was as active as quinine. P-aminobenzoic acid and derivatives were generally inactive but sometimes showed weak prophylactic activity. Cyclohexane derivatives were also generally inactive. The most effective diphenyl derivatives were aminomethyl phenols. When investigating sulphonamides, sulphanilamide was used as the standard, and had low therapeutic and prophylactic activity. Ten substances similarly constituted possessed true prophylactivity while 12 others were partially prophylactic. A wide selection of other ring structures both carbocyclic and heterocyclic with varying substituents came under review. Little activity was shown by the former or by pyridine and piperidine derivatives, but some pyrimidines proved effective agents. Investigation of aliphatic amines and diamines showed that in general greatest activity was found in those of secondary type. Introduction of a substituent quinoline nucleus enhanced activity, and little effect was apparent on introducing sulphur or oxygen atoms.

Examination of a number of antibiotics showed that well known types such as chloramphenicol, aureomycin, terramycin [oxytetracycline] and fumagillin possessed activity, as well as 3 or 4 others which are less well known. Antimetabolites which were analogues of pantothenic acid, amino acids, folic acid, purines and pyrimidines were also tested. Four compounds which were analogues of pantothenic acid proved active.

The compounds discussed above with significant antimalarial activity have been arranged in tables according to minimum effective therapeutic dose (Table 130) and therapeutic index (Table 131) with survey number and chemical designation as well as cross references included. Table 132

lists 15 compounds, mostly sulphonamides, with true prophylactic activity and the following table includes 27 compounds also predominantly sulphonamides, which were partially prophylactic. In the 2 final tables (134 and 135) data are given on a number of alkaloids and miscellaneous compounds, but they appear to be of little interest as far as antimalarial action was concerned.

This Public Health Monograph No. 9 presents an extensive and detailed survey of the subject under review and represents an enormous expenditure of effort. Since studies on the chemotherapy of *P. gallinaceum* infections have in the past yielded considerable dividends, this publication of the authors will be hailed by those who are interested in the wider aspects of the subject of malarial chemotherapy. *J. D. Fulton*

Greenberg, J., Coatney, G. R. & Trembley, Helen L. **The Effect of Pyrimethamine (Daraprim) against** *Plasmodium gallinaceum* **Infections in Chicks.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 771–6. [10 refs.]

Pyrimethamine, 2,4-diamino-5-*p*-chlorophenyl-6-ethylpyrimidine, has been shown to be active against *P. gallinaceum*, *P. berghei*, the simian parasites *P. cynomolgi* and *P. knowlesi* as well as against the human malaria parasites. The literature on the subject has been regularly summarized in this *Bulletin*. The results of an intensive study on its prophylactic and curative activity against *P. gallinaceum* are described in the present investigation. Week-old chicks of 45 to 55 gm. were used. The techniques of inoculation were those described by Coatney *et al.* [see above], and the drug was administered orally in solution or in gelatine capsules. In suppressive tests it was active at doses of 10^{-4} mgm./gm. when given twice daily for 4 days starting a few hours before inoculation. Single doses of 2 to 3 times the above dose had a detectable effect, whereas doses 100 times as great were required to cause disappearance of parasites and relapses occurred approximately 4 days later. Further details of this nature are given in the text.

Prophylactic activity in sporozoite-induced infections was complete with doses of $2{\cdot}5 \times 10^{-4}$ mgm./gm. given twice daily for 4 days and the corresponding single dose of drug required was 5×10^{-3} mgm./gm. On a dosage basis the activity of pyrimethamine against erythrocytic forms was about 100 times that of chlorguanide [proguanil] and 800 times that of quinine. In prophylactic activity the drug was 500 times as effective as sulphadiazine, and a single dose of the drug had the unique property of preventing death from tissue forms in established sporozoite infections, and exerted a marked lethal effect against other tissue forms. The drug is able to sterilize sporozoite-induced infections and to eradicate pre-erythrocytic forms, but is unable to eradicate established erythrocytic infection. *J. D. Fulton*

Rodhain, J. Contribution à l'étude de l'*Hepatocystis* (*Plasmodium*) *epomophori* Rodhain. [**Contribution to the study of** *Hepatocystis* (*Plasmodium*) *epomophori* **Rodhain**] *Ann. Soc. Belge de Méd. Trop.* 1953, Aug. 31, v. 33, No. 4, 285–92, 7 figs. on 4 pls.

Live fruit-bats were sent from Boma in the Congo to Belgium by Drs. Meyus and de Smet. The bats were then studied by the author, who searched in particular for exoerythrocytic stages of *Hepatocystis epomophori*

with which many of the animals were infected. Earlier examination of livers from 4 infected bats had been negative, but in the present series, 4 out of 8 exhibited tissue stages in this organ [see also this *Bulletin*, 1950, v. 47, 1067]. The earliest forms were round solid bodies, as small as 24 μ in diameter, with densely staining cytoplasm studded with heavy chromatin dots; the contour was sometimes lobulated. There was little cellular reaction around the parasite in these early stages. It was impossible to discover in which kind of cell the parasite was developing. Later, growth into a merocyst occurred, with the formation of innumerable merozoites, which finally collected in a rim enclosing a large vacuole filled with a colloidal product. The rim was not a regular circle like that seen in *H. kochi* merocysts, but was irregular with many " digitations ". Cellular reaction around the parasite was now marked and consisted of endothelial and giant cells, the former persisting longest in the terminal scar. The mature merocyst measured $\frac{1}{4}$ mm. Intraperitoneal inoculation of emulsions of infected liver (a) into 3 rodents and (b) into 2 clean fruit-bats did not give rise to any detectable infection up to 5 weeks later. Five fruit-bats—of which 2 were infected—were splenectomized, and the blood was examined to see if the degree of parasitaemia was affected or a latent infection brought to light: no changes were detected and it was assumed that the spleen plays no part in the course of this infection.

Rodhain had studied this parasite nearly 30 years ago [this *Bulletin*, 1927, v. 24, 399] and had at that time noticed erythrocytic forms of the parasite containing up to 8 pieces of chromatin, which he thought represented the beginning of schizogony. He now realizes that the phenomenon was taking place in sexual parasites and comprised nuclear reduction preceding the maturation of the gametocyte. Likewise the small annular forms, which he originally described as asexual rings, he now considers to be growing gametocytes, originating from the merozoites of the liver schizonts. *P. C. C. Garnham*

Garnham, P. C. C. & Heisch, R. B. **On a New Blood Parasite of Insectivorous Bats.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Sept., v. 47, No. 5, 357–63, 24 coloured figs. on 2 pls. [11 refs.]

The authors describe a new Haemosporidian parasite found in insectivorous bats, *Nycteris capensis*, living in caves along the coast of Kenya. The blood of these bats contained only sexual forms in different stages of growth. A characteristic feature of the infection was the presence in infected erythrocytes of about 20 filaments projecting from their surface, which are revealed by deep Romanowsky staining. These filaments are thought to be due to some degenerative change in the red cell. Exoerythrocytic stages were found only in the liver parenchyma cells, in the form of non-cystic lobulated schizonts containing numerous large nuclei, and superficially resembling the pre-erythrocytic stages of *Plasmodium falciparum*.

Attempts to detect the intermediate host of this parasite, in ticks, mites and mosquitoes which had fed on the bats, were unsuccessful.

Since the bat parasite does not fit into any known genus of Haemosporidia, it is regarded as a new genus of the family Haemoproteidae, for which the name *Nycteria medusiformis* gen. n., sp. n. is proposed.

The paper is beautifully illustrated by 2 coloured plates.

C. A. Hoare

Rousselot, R. **Notes de parasitologie tropicale. Tome I. Parasites du sang des animaux. Tome II. Ixodes.**

This book is reviewed on p. 388.

TRYPANOSOMIASIS

Capponi, M. Sur un cas de trypanosomiase congénitale à Douala. [**A Case of Congenital Trypanosomiasis at Douala, French Equatorial Africa**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 667–70. [17 refs.]

Though congenital trypanosomiasis is a rare condition there are several records of it in the literature, some of which are given.

An African male child, weighing 2·7 kgm., was born at Douala on 25 May 1952; his mother, aged 24 years, had just come from a locality where trypanosomiasis was endemic. The child was puny, did not feed well and had some fever; when the child's blood was examined on 3 June 1952, 9 days after its birth, trypanosomes were found in it. Examination of the mother's blood the following day also revealed trypanosomes, but the woman did not show any symptoms [signs] of the disease. Both mother and child were treated with Lomidine; but in view of the child's poor condition and severe anaemia this was stopped after 2 injections, the trypanosomes had vanished from the blood by then. Docémine injections were then given, but the child died suddenly on 17 June 1952 of cardiac failure.

It would seem in this case that the mother became infected with *Trypanosoma gambiense* during her pregnancy, and that she transmitted the infection to her child, who was born in a town under circumstances precluding acquirement of the disease normally. If the diagnosis had been made pre-natally, or in the case of the child immediately after birth, and had not been delayed until the ninth day of the child's life, specific treatment might have saved him. Well established trypanosomiasis in a woman does not permit of a normal pregnancy, so in this case the mother must have become infected late in the period of pregnancy. *A. R. D. Adams*

Williamson, J. **Observations on the Dehydrogenase Activity of Normal and Drug-Resistant Strains of** *Trypanosoma rhodesiense*. *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 348–57. [28 refs.]

Some authors, using the Thunberg technique with methylene blue, have shown that certain trypanosomes possess dehydrogenase systems. The present author has described a method for the photometric estimation of dehydrogenase activity and has used it for comparing such activity in normal and arsenic-resistant strain of *T. rhodesiense*. Matched Thunberg tubes were used in the Hilger " Spekker " absorptiometer and allowed rapid and accurate determination of the optical densities of the methylene blue solutions. An end point with complete decolourization of the reagent was obtained with sodium hyposulphate $Na_2S_2O_4$. *T. rhodesiense* was freed from red cells by the differential centrifugation of the blood of a heavily infected rat and final suspension was made in Ringer-buffer at *p*H 7·4 to the correct dilution. Each Thunberg tube contained 2·5 ml.M/30,000 methylene blue, 2·0 ml. Ringer-buffer with or without substrate and 0·5 ml.

of the standard trypanosome suspension. After evacuation the tubes were sealed and incubated for 10 minutes at 25°C. prior to mixing of contents by inversion. Mixing was repeated every minute and at 10- or 15-minute intervals the optical density of the solution in each experimental tube was read. Early irregularities occurred in the results when glucose was used as substrate and it appeared that rabbit or other serum was necessary for dehydrogenase activity since it probably contained a cofactor. The serum was finally replaced by 0·1 per cent. peptone which lacked endogenous activity. Besides glucose which was used as standard substrate 9 others were employed. By this means it was possible to show differences in the reaction rates between the normal and drug-resistant trypanosome, indicating a difference in metabolic function of the 2 strains. A relationship between the acquirement of resistance and oxidative metabolism is suggested.

J. D. Fulton

VAN GOIDSENHOVEN, C. & SCHOENAERS, F. **The Collecting of Trypanosomes for Antigen-Preparation.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase. No. 195.* Léopoldville (Congo Belge). International Scientific Committee for Trypanosomiasis Research. Fourth Meeting, held at Lourenço-Marques, from 25th to 30th Sept., 1952. Fasc. 2, Paper No. 17, 3 mimeographed pp., 1 fig.

The authors describe a simple and quick method for collecting and preserving trypanosomes intended for the preparation of antigen for the complement-fixation reaction. First, 1 cc. of 50 per cent. dilution of the blood of a rat at the height of infection is inoculated intraperitoneally into another rat. When the infection in the latter is at its maximum, blood is withdrawn by resection of the jugular and carotid vessels, after which 0·1 cc. of 5 per cent. solution of liquoid " Roche " is added to prevent coagulation. After filtration through glass wool, the blood is poured into a glass tube (27 × 90 mm.), the bottom of which is stoppered with a rubber plug, leaving the top open.

The mixture is centrifuged for 30 minutes at 3000 r.p.m., after which it forms 3 layers in the tube: red blood corpuscles at the bottom, trypanosomes in the middle, and plasma at the top. After elimination of the last, the tubes are exposed to freezing at −40°C., and can be preserved in this state for several days. When required, the tube is warmed slightly, the plug is removed, the cylinder of frozen infected blood is pushed out, and the layer containing the trypanosomes is separated with a scalpel. The average weight of trypanosomes obtained in this way from one rat is 0·5 gm.

For the preparation of antigen the trypanosomes are suspended in a mixture of equal volumes of glycerin and saline, in the proportion of 1 gm. trypanosomes per 2 cc. of the fluid. This provides raw antigen which can be preserved for several weeks at −40°C. *C. A. Hoare*

EVENS, F., SCHOENAERS, F. & KAECKENBEECK, A. Note sur l'amélioration du rendement dans la préparation de l'antigène trypanosomique suivant Van Goidsenhoven Ch. et Schoenaers F. [**Improvement in the Yield of Trypanosome Antigen**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 217–19.

The authors describe an improvement in the method of obtaining trypanosome antigen for the complement-fixation reaction, which had been evolved by VAN GOIDSENHOVEN & SCHOENAERS [see above]. For this purpose rats

weighing about 250 gm. were injected intramuscularly with 5 mgm. of ephedrine hydrochloride a quarter of an hour before being sacrificed. Some of the rats thus treated were bled at the height of infection, others earlier.

In both cases, the weight of the spleens of treated rats was lower than that of untreated controls, while the quantity of blood and of trypanosomes obtained from them is greater. As regards the average weight of trypanosomes per cc. of blood, it differed according to whether the animals were bled before or after reaching the height of infection. In the former case, an increase in the total weight of trypanosomes per rat (0·626 gm. against 0·574 gm. in controls) was due to a higher yield of blood, but, since this resulted in a higher dilution of the peripheral blood, the weight of trypanosomes per cc. was lower (0·079 gm. against 0·083 gm. in controls). In the latter case, both the total yield of trypanosomes (0·702 gm. against 0·507 gm. in controls) and their weight per cc. (0·092 gm. against 0·071 gm.) was greater.

In general, the administration of ephedrine to infected rats used for the preparation of antigen increases the yield by 10 per cent., but when the animals are bled in the terminal phase of the infection, the yield may be increased by 38 per cent. Otherwise, there are no qualitative differences between the antigens obtained by these methods. *C. A. Hoare*

Woolfe, G. **The Trypanocidal Activity of Dithiobiuret Derivatives.** *Brit. J. Pharmacol. & Chemotherapy.* 1953, Dec., v. 8, No. 4, 420–23.

The activity of the thiobiuret derivatives used in the present tests was discovered during routine screening of synthetic agents for chemotherapeutic action. They are of the general formula

$$H_2N.\ C(=S)-NH-C(=S)-NH_2$$

and one or more of the hydrogen atoms may be substituted by other groups. As a class they had a low solubility in water and were generally used in suspension with a wetting or dispersing agent Dispersol LN. Mice infected by blood inoculation were treated by subcutaneous inoculation with single doses, or daily for 5 days. The drugs showed little activity against *T. rhodesiense*, *T. gambiense*, *T. brucei*, or *T. cruzi*, but possessed some curative properties against *T. congolense*. The best results were unexpectedly obtained with repeated doses in spite of low solubility and method of dosage. This fact would prove a drawback in the field. The ratio LD50 to CD50 was high in some cases. *J. D. Fulton*

Le Gac, P. **Trypanosomiasis in Oubangui-Chari.** (Principal Reservoirs of Infection and the Results of Chemoprophylaxis with Pentamidine and Lomidine.) *West African Med. J.* 1953, Oct.–Nov.–Dec., v. 2 (n.s.), No. 4, 181–92, 1 map.

Three principal endemic foci of sleeping sickness exist in Oubangui-Chari. In spite of an intensified attack after the second world war the infection rate could not be reduced below between 4 and 7 per cent. Chemoprophylaxis was tried and the results obtained and reported in French journals have already been summarized [Le Gac, this *Bulletin*, 1952, v. 49, 245; 1953, v. 50, 288; 689]. Almost complete eradication of sleeping sickness was achieved by the prophylactic use of pentamidine or lomidine (the

dimethylsulphonate of pentamidine base). The author concludes that this is the method of choice in dealing with endemic centres of trypanosomiasis in either savannah country or the forest. Administrative methods and bush clearance must also be used to ensure permanent success. *T. H. Davey*

Uganda Protectorate. **Annual Report of the Tsetse Control Department for the Year ended 31st December, 1952** [Moggridge, J. Y., Director]. 21 pp., 1 folding coloured map. 1953. Entebbe: Govt. Printer. [Shs. 1/50.]

When the Tsetse Control Department of Uganda was set up under the Directorship of Mr. J. Y. Moggridge in 1947 about three-quarters of the Protectorate was infested with tsetse. Since then about 4½ million acres have been reclaimed. The present Annual Report is not only an account of current and projected control but a review of the history of the earlier fly invasions and the progress and effects of control measures against them since 1947.

The general policy of the department has been to force tsetse fly back to certain areas where consolidation lines could be established as a protection against recurring re-invasion of reclaimed territory. One such line has been reached in Karamoja in northern Uganda and another is being approached in central Uganda. A third sphere of activity in south-west Uganda is still in the nature of a defence line to hold threatening fly invasion from the north and west. These 3 areas, and some subsidiary schemes, are shown in an attached map. The consolidation and defence lines are not contiguous but intervening areas consist of wide stretches of country in which one or more of 3 factors—the Nile river and lake system, open country, or human population and cultivation—provide effective barriers to tsetse occupation or dispersal. The line of protection compounded of natural barriers of the sort described and the areas of active control work runs almost a straight course across Uganda from north-east to south-west.

South and east of the line the Protectorate is now largely free of *G. morsitans* and *G. pallidipes*, although *G. palpalis* occurs on river courses and lake shores, while north and west of the line extensive areas are still infested with *G. morsitans* (in the north of Acholi and Karamoja adjacent to the Sudan), with *G. morsitans* and *G. pallidipes* in the central area of the territory, and *G. pallidipes* in Ankole and Kigezi. *G. palpalis* in riverine environments and *G. fuscipleuris* in forest are also present, these being controlled in the Kigezi district as well as *G. pallidipes* and *G. palpalis*. The overall control policy is directed towards reclaiming land for cattle grazing and, on this account, the resources of the department have been primarily concentrated on *G. morsitans* and *G. pallidipes*.

A table summarizes the methods adopted in the different areas and the results obtained in terms of areas reclaimed. Methods have consisted to a large extent of hunting and killing game, particularly buffalo, with sheer or discriminative clearing of thicket and bush which, from fly surveys, appeared to be the principal foci of the tsetse fly and harbourages for game, especially buffalo. Between 1947 and 1952 over 1 million man-days were required for clearing in all the schemes in the country; nearly 30,000 head of game were shot. Some 4,000 were buffalo, and other animals shot in substantial numbers were bushbuck, warthog, waterbuck, kongoni, duiker, reedbuck, cob and oribi. The total area reclaimed amounts to 6,630 sq. miles, and 1,120 sq. miles are expected to be clear of fly in the early future. Cattle grazing has been resumed in several parts of the formerly

tsetse-infested land, the re-introduction of cattle being preceded by a satisfactory absence of trypanosomiasis in test herds over several months to a year. Certain stock routes abandoned on account of trypanosomiasis in the past are likely to be safe for use in the near future. The cost of reclamation was on the average about 50 cents [100 East African cents = 1 shilling] per acre.

The details provided for the various control schemes in different parts of the country are interesting for their historical background and the descriptions of the different methods, and combinations of methods, called for to meet the variety of problems which have been exposed during the years of the department's activities. Future plans envisage an attack on tsetse fly north and west of the present line which affords protection against re-invasion of the reclaimed territory. *D. S. Bertram*

Meyers, W. M. & Lysenko, M. G. **Effect of Sodium Salicylate Treatment on Antibody Titers in Rats infected with** *Trypanosoma lewisi*. *Proc. Soc. Exper. Biol. & Med.* 1953, Oct., v. 84, No. 1, 97–8. [11 refs.]

"Daily treatment with sodium salicylate reduced the concentration of circulating antibody in rats infected with *T. lewisi*. Possible modes of action are discussed."

Baernstein, H. D. **Malic Dehydrogenase and Related Enzymes in the Culture Form of** *Trypanosoma cruzi*. *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 380–96, 3 figs. [30 refs.]

"1. A very active malic dehydrogenase has been found in homogenates of *T. cruzi*.

"2. Conditions for maximum activity of diphosphopyridine nucleotide reduction have been determined.

"3. Malic dehydrogenase is linked to cytochrome c reduction, indophenol reduction and fumarate reduction presumably through flavoproteins.

"4. Fumarase having an optimum pH 7·8 is present. The activity is equivalent to 60·8 μl fumarate per mg dry weight per hour. This may not be maximal.

"5. Oxalacetate and iodoacetate inhibit malic dehydrogenase.

"6. Homogenates may be stored in air at 5°C for several days. Only about 2% activity is lost per day.

"7. The activity of malic dehydrogenase in homogenates parallels the extent of cell rupture when isotonic KCl is used as suspending medium."

Prager S., Ruth. Acción de la cortisona, del acetato de cortisona y del "cortone" sobre el consumo de oxígeno de formas de cultivo de *Trypanosoma cruzi*. [**Action of Cortisone, Cortisone Acetate and Cortone on Oxygen Consumption of Cultures of** *T. cruzi*] *Bol. Informaciones Parasitarias Chilenas*. 1953, July–Sept., v. 8, No. 3, 52–3. [10 refs.]

The English summary appended to the paper is as follows:—

"Cortisone, cortisone acetate and 'Cortone' produced a regular, though not very intense inhibition of the oxygen consumption of cultures of *Trypanosoma cruzi*."

Guedes, A. da S. & Mendonça, D. da S. Nota sôbre o encontro de exemplares de *Panstrongylus megistus* infectados pelo *Schizotrypanum cruzi* e captura de um exemplar de *Triatoma infestans*, em Belo Horizonte, Minas Gerais. [**Finding of** *Panstrongylus megistus* **Infected by** *T. cruzi* **and of Presence of** *T. infestans* **in Belo Horizonte, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, July, v. 5, No. 3, 217–18.

The English summary appended to the paper is as follows:—

"*Triatoma infestans* for the first time is found in Belo Horizonte, state of Minas Gerais. For the first time also a species of *Triatominae*, *Panstrongylus megistus*, is found naturally infected by *S. cruzi* in the same town."

Dias, E., Laranja, F. S., Nery-Guimarães, F. & Brant, T. C. Estudo preliminar de inquéritos sorológico-eletrocardiográficos em populações não selecionadas de zonas não endêmicas e de zonas endêmicas de doença de Chagas. [**Serological and Electrocardiographic Studies of Unselected Populations in Non-Endemic and Endemic Areas of Chagas's Disease**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, July, v. 5, No. 3, 205–10.

The English summary appended to the paper is as follows:—

"1. The results of a survey made in non-selected population from non-endemic areas of Chagas' disease (Baixada Fluminense, State of Rio de Janeiro) are reported:

"(a)—Out of 1,078 complement fixation test for Chagas' disease, 66 were positive (6·1%), in 8 the results were doubtful (0·7%) and in 1,004 were negative (93·1%);

"(b)—Out of 1,236 electrocardiograms, 70 were abnormal (5·7%) and 1,186 were normal (94·3%).

"2. These findings were compared with those previously obtained from endemic areas of Chagas' disease in the State of Minas Gerais, in which the following percentages have been found:

"(a)—Out of 1,727 complement fixation tests for Chagas' disease 976 were positive (56·5%);

"(b)—From 410 electrocardiograms, 65 were abnormal (15·8%).

"3. Comparing the above mentioned results it is evident that the positivity of complement fixation test for Chagas' disease is more than 8 times as frequent in endemic areas than in non-endemic areas of the disease.

"4. Some electrocardiographic abnormalities commonly found in cases of chronic Chagas' heart disease (RBBB, A-V blocks, ventricular premature contractions, etc.) occurred in relatively high percentages of people from the endemic areas and only exceptionally in persons from the studied non-endemic areas.

"5. Judging by the electrocardiographic abnormalities, the incidence of myocardial changes was about 3 times more frequent in the endemic than in the non-endemic areas of Chagas' disease."

FEVERS OF THE TYPHUS GROUP

BOVARNICK, Marianna R., ALLEN, Emma G. & PAGAN, Gloria. **The Influence of Diphosphopyridine Nucleotide on the Stability of Typhus Rickettsiae.** *J. Bacteriology.* 1953, Dec., v. 66, No. 6, 671–5.

"The survival of rickettsiae as measured by their toxicity for mice, hemolytic activity, or infectivity for eggs is increased in the presence of added diphosphopyridine nucleotide and markedly decreased by autoclaved diphosphopyridine nucleotide. The toxic effect of autoclaved diphosphopyridine nucleotide can be prevented by the simultaneous addition of unaltered diphosphopyridine nucleotide.

"Diphosphopyridine nucleotide increases the rate of oxygen uptake of rickettsiae with glutamate as substrate. Autoclaved diphosphopyridine nucleotide at a concentration of 0·27 mg per ml inhibits the rate of oxygen uptake 40 to 50 per cent. This inhibition can be prevented by addition of unaltered diphosphopyridine nucleotide."

DE MAGALHÃES, O. Contribuição ao conhecimento das doenças do grupo tifo exantemático. [**A Contribution to Knowledge of the Diseases of the Typhus Exanthematicus Group**] *Monografias Inst. Oswaldo Cruz.* 1952, Jan., No. 6, 968 pp., numerous illustrations. [Bibliography.] English summary.

This is a remarkable work; it is a large and heavy volume of 968 pages with 309 illustrations. There is a bibliography of 70 pages containing about 1,200 detailed references including 57 to articles by the author dated 1933–44. Many of the author's contributions have been reviewed in this *Bulletin*; his unconventional outlook on the typhus fevers can be judged by the following classification:

Typhus Exanthematicus Group

I. Group of Universal Forms
- (a) European, historic or classical typhus exanthematicus
  - Classical epidemics
  - Mexican and Venezuelan forms
- (b) Murine typhus
  - Identified in many countries, including Brazil, Argentina and Chile

II. Group of American Forms

American exanthematic typhus, autochthonous diseases, or universal but greatly modified by the vectors and the American habitat

Sub-groups
- (1) Brill's disease
- (2) Murine typhus and its Mexican variety, Tabardillo
- (3) Rocky Mountain spotted fever
- (4) American Q fever
- (5) Neotropical exanthematic typhus (Brazil, Colombia, Venezuela, Peru, Guiana, Bolivia and Mexico)

A list of 21 synonyms is given of neotropical exanthematic typhus including 4 proposed at different times by the author who sharply rebukes the reviewer for opposing the multiplication of new names for the same disease [see this *Bulletin*, 1944, v. 41, 31].

The author has always strongly maintained that the bed bug is an important vector of the disease and that for this reason the name tick typhus is unsuitable.

The book contains a vast store of information; it is a monument to the industry and erudition of the author and many of its pages are enlivened by caustic comments on workers whose views are contested.

The bibliography is a very valuable feature though there is a sprinkling of misprints; even the author's own name is wrongly spelled on one occasion and Ida Bengtson's name appears 6 times as Bengsttson.

John W. D. Megaw

American Geographical Soc. **World Distribution of Rickettsial Diseases. 1. Louse-Borne and Flea-Borne Typhus.** *Atlas of Diseases.* Plate 10 (3 coloured maps on folding pl.). [Numerous refs.] 1953. New York 32: Broadway at 156th Street. [$1.25.]

This is the 10th sheet of an Atlas of Diseases which is being prepared by the American Geographical Society; its main feature is a folding map of the world on which is shown the distribution of louse-borne and flea-borne typhus. The map is about 35 by 20 inches in size, it is drawn on the Briesemeister elliptical equal-area projection system which has the advantage of showing every part of the world on the same scale of 1 : 37,500,000, but has the drawback of showing some places on the equator near the bottom of the map and others near the top; North Australia, for example, is shown on the same level as the British Isles. Louse-borne and flea-borne typhus, when they occur alone, are shown in red and blue respectively; when they occur together they are shown in purple. Two very small maps show the distribution of louse-borne typhus during and shortly after the two world wars. On the back of the sheet and in the available corners of the front a great deal of useful information is given, especially an extensive bibliography showing the sources of the information dealing with the distribution of the diseases. The main map is a fine piece of work; it will be very useful provided the inevitable imperfections of all such maps are taken into account.

In the epidemiological notes the authors rightly state that louse-borne typhus is a disease of "the colder season in temperate lands and of tropical uplands"; so also experience shows that the disease is rare or unknown in tropical lowlands, yet the whole of India is shown in purple indicating that the disease occurs all over the subcontinent, whereas it is restricted to a very small proportion of the area. So also vast areas of tropical Africa and South America are shown in purple though the disease is likely to be as restricted in distribution as it is in India. It might be better to show the areas in which louse-borne and flea-borne typhus have been confirmed as occurring during the past few years, and to include a small-scale map showing all the areas in which louse-borne typhus has been known to occur.

John W. D. Megaw

Kryński, S. & Radkowiak, J. Dalsze badania nad działaniem barwników na *R. prowazeki*. [**Further Studies on the Influence of Dyes on *R. prowazeki***] *Med. Dośw. i Mikrob.* Warsaw. 1953, v. 5, No. 4, 449–56.

The English summary appended to the paper is as follows:—

"Physiological salt solution is not an appropriate medium for *R. prowazeki*. Therefore phosphate buffer solution, 50 per cent. milk and

50 per cent. human serum were used in the study regarding the influence of methylene-blue and toluidine-blue on *R. prowazeki*. The dyes were most active in the buffer solution, and least active in milk. This was specially observable in the case of toluidine-blue. The differences in the action of dyes in various media are especially clearly seen in daylight.

"Large (2 micr.) and giant (5 micr.) forms were seen in all media. They appeared also in lice infected with a suspension containing no dye, but strongly diluted (1 intestine in 10 ml.). From these observations the authors advance a new hypothesis.

"It is not based on the detrimental effect of the dye, but on louse resistance, which can more easily reveal itself if suspensions weakened by dilution or by the action of the dye, are used.

"Atypical forms are usually accompanied by a low degree of infection of the insect. It is possible that the appearance of giant forms is the result of unfavourable conditions of the organism of the host—its defence may be more effective when the degree of infection is low."

National Research Council, Division of Medical Sciences, Committee on Pathology [Karsner, H. T., Chairman], with the collaboration of the Armed Forces Institute of Pathology. **Pathology of Epidemic Typhus.** Report of Fatal Cases studied by United States of America Typhus Commission in Cairo, Egypt, during 1943–1945. *Arch. Pathology.* 1953, Oct. & Nov., v. 56, Nos. 4 & 5, 397–435; 512–53, 49 figs. [Numerous refs.]

This report has been prepared by a committee of 13 specialists in pathology, and 13 others have made contributions to the work involved in its preparation. It consists of an account of the pathology of epidemic typhus based on material obtained from 39 fatal cases that were studied by the U.S.A. Typhus Commission in 1943–1945 during an epidemic of the disease in Cairo. The important clinical and laboratory findings in all the cases are shown in a table under 31 headings and the incidence of the typhus lesions found at autopsy is summarized under 44 headings, each of which indicates an organ of the body. Each member of the committee has contributed a description of the pathology of one or more of the systems or organs of the body and has included comments on the relevant references in the literature. The bibliography contains more than 100 detailed entries and there are 49 excellent photomicrographs. The report constitutes a comprehensive and up-to-date monograph on the pathology of louse-borne typhus of the severe form seen in epidemics among ill-nourished and overcrowded communities. The author of the summary remarks that it seems likely, in view of the discovery of effective antibiotics and satisfactory vaccines that there may never again be a similar opportunity of studying an epidemic of typhus unmodified by treatment or complicating infections. He also states that the lesions discovered were essentially the same as those described in previous epidemics and in experimental animals.

A few points of general interest are as follows. Circulatory failure is regarded by some recent observers as being essentially a peripheral vascular failure attributable to damage to the capillaries or to injury of the vasomotor centres, or to both of these factors, but the committee are of opinion that myocarditis cannot be ignored. The disease is essentially a vasculitis beginning with damage to the endothelial cells of the capillaries which are invaded at an early stage by the rickettsiae. There was evidence pointing to the occurrence of a true rickettsial pneumonia; this consisted in the finding of rickettsiae in the absence of other organisms in sections of the

lungs. No evidence of glomerulo-nephritis was seen and a review of the literature led to the conclusion that its occurrence has not been proved. The occurrence of vasculitis, hyaline threads, nodular and diffuse accumulations of mononuclear cells, myocarditis, myositis, and nodules in the central nervous system is probably diagnostic of rickettsial infections, though similar lesions may occasionally occur in viral, bacterial or parasitic infections. In practice, however, difficulties of diagnosis seldom occur. It is said to be very difficult, and often impossible, to distinguish epidemic typhus from Rocky Mountain spotted fever and scrub typhus on the basis of a study of the lesions. A summary is given of recent views on the differential features of the pathology of these three diseases. Q fever, rickettsialpox and other human rickettsial diseases differ so much from epidemic typhus, both clinically and pathologically, that they are easily distinguished in most cases.

The article is as authoritative as it is possible for any work of the kind to be; it represents the agreed opinion of a large number of leading experts.

John W. D. Megaw

Giroud, P., Capponi, M. & Roger, F. Réactions sérologiques vis-à-vis des rickettsioses chez des travailleurs de la viande à Douala (Cameroun). [**Serological Reactions in the Rickettsial Diseases of Fleshers in Douala (Cameroons)**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 649–50.

Workers in the slaughter houses of Douala come into contact with cattle from all over the east and north-east of the Cameroons. Among 113 healthy African workers the following reactions were observed:—

	1 in 16	1 in 20 to 1 in 40	1 in 80	1 in 160 or over	Negative
Epidemic typhus ...	—	—	5	10	98
Murine typhus ...	—	—	3	11	99
Boutonneuse fever ...	—	35	9	1	78
Q fever	7	9	—	—	97

Among the 15 persons positive with epidemic antigen 5 reacted also with murine antigen and 1 with boutonneuse antigen. *John W. D. Megaw*

Giroud, P., Pfister, R., Ridet, J. & Roger, F. Ce que l'on peut conclure de constatations sérologiques faites vis-à-vis des rickettsioses sur des Africains et des animaux domestiques en Haute-Volta. [**Conclusions from Serological Findings in the Rickettsioses of Africans and of Domestic Animals of Upper Volta**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 650–53.

At Bobo in Upper Volta rickettsiae-agglutination tests were carried out on 31 drovers engaged in bringing cattle from pasture grounds at a distance of 3–8 days' journey. One reacted with murine antigen at 1 in 160; 6 reacted with boutonneuse antigen at 1 in 40 to 1 in 160 and 4 reacted with Q fever antigen at 1 in 32.

Among 37 slaughter-house workers at Bobo 2 reacted with epidemic typhus antigen at 1 in 280 and 1 in 640 respectively; these reactions were regarded as being associated with boutonneuse-fever infection. With murine antigen 2 sera were positive at 1 in 160 and 1 at 1 in 280. With boutonneuse antigen 6 reacted at 1 in 40 to 1 in 320. Among 25 of these persons who were tested with Q fever antigen 9 reacted at 1 in 16 or 1 in 32.

Among 19 cattle 4 reacted with epidemic typhus antigen at 1 in 160 or 1 in 320; these were regarded as indicating boutonneuse-fever infection.

With murine antigen 5 reacted at 1 in 160; with boutonneuse antigen 3 reacted at 1 in 40 or 1 in 80, and with Q fever antigen 1 reacted at 1 in 20.
John W. D. Megaw

Swamy, T. V. & Dutta, B. B. **Epidemiology of XK Typhus in Jamshedpur.** *Indian Med. Gaz.* 1953, Oct., v. 88, No. 10, 522–5, 5 graphs on 5 pls.

During the 3 years 1948–1950 the numbers of cases of scrub typhus diagnosed by the *Proteus OXK* reaction in Jamshedpur, Bihar, were 207, 200 and 105, respectively. Jamshedpur is a large industrial town which has sprung up within less than 50 years in connexion with the great Tata Iron and Steel Corporation; the population is now nearly 200,000. The houses are said to be surrounded by scrub and grass land. The authors do not mention in the text that a clinical description of 400 cases of scrub typhus in this town from October 1947 till November 1949 was published by Khan in 1950 [see this *Bulletin*, 1951, v. 48, 354].

Most of the patients were males (76 per cent.) and the highest incidence was among adults aged 21 to 50 years (73 per cent.). Very few cases occurred between early January and the onset of the rains in May or June when the numbers rose rapidly, reaching the maximum in September to early November and falling rapidly with the onset of the cool dry season in November.

Trapping of rodents was carried out throughout the year 1951 when 1,418 *Rattus rattus*, 33 *Bandicota bengalensis* and 11 *Mus musculus* were caught. The number of *R. rattus* found infested with mites was 48 (3·38 per cent.); the mites found were *Trombicula deliensis* on 22 rats; *Schöngastiella bengalensis* on 15 rats and *Neoschöngastia* sp. on 14 rats. The infestation rate of *B. bengalensis* was much higher (72·72 per cent.) but no *T. deliensis* were found; 19 of these rodents were infested with *S. bengalensis* and 5 with *Neoschöngastia*. No mites were found on any of the mice.

Of the 48 cases of infestation of *R. rattus* only 6 occurred in the 6-month period December to May. *John W. D. Megaw*

Giroud, P., Le Gac, P., Roger, F., Le Hénaff, A. & Lemaigre, C. Les pneumopathies des rickettsioses du groupe boutonné pourpré. [**The Pneumopathies of Rickettsioses of the Boutonneuse-Rocky-Mountain-Spotted-Fever Group**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 655–9.

Cases are sometimes seen in which serological tests for boutonneuse fever are positive and there are pulmonary manifestations but neither a *tache noire* nor an inoculation eschar. The occurrence of such cases suggests that a different mode of transmission may cause a generalized infection with pulmonary localization. Another possibility is that the patients may have had a latent infection which becomes activated in the lungs by sudden changes in the atmospheric temperature. Four such cases were seen during outbreaks of severe fever in villages of Oubangui-Chari in French Equatorial Africa. Two of the patients were French officers who had gone to visit 3 villages in which 39 cases with 26 deaths occurred among a population of 466 inhabitants. The diagnosis was made 4 months after recovery, by agglutination- and complement-fixation tests with boutonneuse antigen, and by complement-fixation tests with South African tick-bite fever antigen. Four convalescents from one of the villages were tested a month after the outbreak and gave positive agglutination reactions at titres of 1 in 16 to 1 in 128 with boutonneuse antigen. In another village there were 36 cases

and 20 deaths in a population of 600, and a month after the end of the epidemic 4 among 9 former patients gave agglutination reactions with boutonneuse antigen at titres of 1 in 40 to 1 in 80. In this village the patients had fever with cough and blood-stained sputum. A similar epidemic occurred in another village in which 7 deaths occurred among 300 inhabitants; the serum of one former patient was tested and found to agglutinate the same antigen at 1 in 320. These outbreaks occurred between November 1951 and January 1952. They were attributed to the recrudescence of latent infections among badly-nourished people who were exposed to sudden spells of cold weather. *John W. D. Megaw*

World Health Organization: Monograph Series No. 19. 275 pp. **Advances in the Control of Zoonoses. Part IV. Q Fever.** pp. 155–212, 7 figs. [71 refs.] WHO/FAO Seminar on Zoonoses, Vienna, Nov. 1952. 1953. Geneva: Palais des Nations. [15s.; $3.00; Sw.fr. 12.–.] [Issued also as *FAO Agricultural Studies No. 25.*] [Sales agent for U.K., H.M. Stationery Office.]

These papers form part of a larger monograph containing the principal papers and discussions arising at the WHO/FAO Seminar on Zoonoses, held in Vienna in November 1952.

In the first, Babudieri, from the *Istituto Superiore di Sanità* in Rome, reviews the history and epidemiology of Q fever, the various surveys of animals and the possible means of transmission, noting the gaps which still remain in our knowledge of the epidemiology of the disease. He then discusses the serological and allergic reactions used in diagnosis and deals at length with the means which may be used in prophylaxis.

Kaplan and Hulse, from the WHO and the Ministry of Agriculture and Fisheries in England, respectively, review the prevalence of Q fever in Europe and give records of the findings in surveys in many countries. They then describe in detail the method employed in the survey of blood, milk and serum samples, with special reference to the performance of the complement-fixation reaction.

Babudieri describes the various techniques used in the diagnosis of Q fever, including animal inoculation, complement-fixation, agglutination, opsonin and allergy tests.

In the discussion which followed the papers, many subjects were raised: these included standardization of diagnostic material, the value of the various tests, differential diagnosis, variations in the character and transmission of the disease in different areas, the apparent absence of clinical signs of the disease in animals and its epidemiological significance, the possibilities of vaccination, and the need for studying whether wild animals, especially rodents, could act as reservoirs of Q fever.

A large amount of the work reviewed in these papers has already been noted in this *Bulletin* in recent years: but its compilation under one cover, together with the 3 authors' own original contributions, provide a very useful compendium of existing knowledge of Q fever.

H. J. O'D. Burke-Gaffney

Babudieri, B. Epidemiologia, diagnosi e profilassi della febbre Q. [**Epidemiology, Diagnosis and Prophylaxis of Q Fever**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1953, v. 16, Pts. 7, 8 & 9, 544–86. [46 refs.] English summary (3 lines).

A comprehensive account and review of the present position. This will be valuable to those interested who read Italian. Much of the information contained in this paper is the same as that given in the author's contribution to WHO Monograph No. 19, *Advances in the Control of Zoonoses* [above].

Stokes, Joan. **"Q" Fever in South Australia: II. Surveys of Human and Bovine Sera.** *Med. J. Australia.* 1953, Nov. 21, v. 2, No. 21, 778–80.

This study brings up to date the history of Q fever in South Australia where the disease was first reported by the author in her description of an outbreak of 14 cases among abattoir workers in Adelaide in the summer of 1947–48. In the survey now described, which was made 12–16 months later, the sera of 79 abattoir workers in Adelaide were tested by the complement-fixation reaction and 26 were positive including 10 from 12 of the persons attacked in the previous outbreak. One of these former patients had a titre of 1 in 2,048 when tested 15 months after the illness and of 1 in 512 as late as 29 months after the illness. The titres in the other positive cases averaged 1 in 16 to 1 in 32.

Since the original outbreak 5 more cases were detected at intervals up to December 1950; a further group of 7 cases occurred in February and March 1951, and there were 2 cases in 1952. All these cases were of persons associated with abattoirs or with cattle. There was none among persons connected with the slaughter or care of sheep only. Four occurred among laboratory workers at times when work was being done on yolk-sac cultures of the organism.

Sera were tested from 108 persons in the city and country who were not associated with abattoirs and only one gave a reaction which was very doubtfully positive. Sera of 793 cattle were tested between December 1949 and December 1950, with completely negative results; these cattle came from the following areas:—318 for southern and western Queensland; 158 from South Australia; 50 from western New South Wales; 224 from the Northern Territory and 43 from unknown sources.

Human infections were believed to originate from small isolated foci of the disease among cattle, but none of these could be detected by the survey.

John W. D. Megaw

Beech, Margaret, Howes, D. W. & Miles, J. A. R. **Observations on Serum from Aborigines in the Northern Territory of Australia: II. Antibodies against Murray Valley Encephalitis (X Disease), Psittacosis and "Q" Fever.** *Med. J. Australia.* 1953, Nov, 21, v. 2, No. 21, 776–8.

Part of the authors' summary is as follows:—

"3. Antibodies to *Coxiella burneti* were found in only two districts, and it is suggested that there is probably an endemic focus of the disease to the west of Alice Springs and possibly another to the east of Katherine."

[The full summary of this paper appears in the *Bulletin of Hygiene*, 1954, v. 29, April.]

Giroud, P., Le Gac, P. & Roger, F. Peut on comparer les résultats obtenus par les réactions allergiques (test d'hypersensibilité), la fixation du complément et l'agglutination de *Rickettsia burneti*? [**A Comparison of the Results of the Allergic Reaction (Hypersensitivity Test) with those of the Complement-Fixation and Rickettsia-Agglutination Reactions in Q Fever**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 653–5.

Among 14 persons who had been attacked by Q fever a year previously the rickettsia-agglutination titre which had been positive in all at titres ranging from 1 in 10 to 1 in 320 were found to be still positive in 7 cases at titres of 1 in 10 to 1 in 40. The complement-fixation reaction was still

positive in only 4 cases. The Giroud intradermal hypersensitivity reaction was positive in every case; the intensity of the reaction was judged by the standard proposed by Giroud and Vargues [this *Bulletin*, 1948, v. 45, 1075]. In 5 cases it reached or exceeded the index of 900 and in 7 cases it was 100 or over whereas in control healthy persons it was always 0.

John W. D. Megaw

Renoux, G. & Maurin, J. Fièvre Q et brucellose. Les réactions sérologiques croisées ne sont pas dues à un antigène commun. [**Serological Cross Reactions between Q Fever and Brucelloses not Due to a Common Antigen**] *Ann. Inst. Pasteur.* 1954, Jan., v. 86, No. 1, 112–15.

Le Gac, P., Giroud, P., André, M. & Roger, F. Deux modes de contamination professionnelle par la fièvre Q. [**Two Kinds of Occupational Infection with Q Fever**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 659–62. [11 refs.]

Two cases of Q fever are described in which the disease occurred during the performance of professional duty; they were regarded as occupational, entitling the patient to compensation. One patient was a veterinary officer engaged in the inspection of cattle in Oubangui-Chari, the other was an entomologist of the National Museum of Natural History in Paris who was engaged in a study of living trombiculae from Oubangui-Chari; it was thought that he had either inhaled the larvae of the mites or become infected by the alimentary or conjunctival routes by his fingers which had become contaminated by manipulation of the infected mites. *Rickettsia burneti* is known to survive in the body of mites that have fed on infected animals.

John W. D. Megaw

Abinanti, F. R., Lennette, E. H., Winn, J. F. & Welsh, H. H. **Q Fever Studies. XVIII. Presence of *Coxiella burnetii* in the Birth Fluids of Naturally Infected Sheep.** *Amer. J. Hyg.* 1953, Nov., v. 58, No. 3, 385–8. [13 refs.]

Amniotic and allantoic fluids are included under the name "birth fluids". The fluids were collected from 34 sheep in an area of North Carolina where Q fever was endemic. Placental tissues of 29 of the sheep were also tested. The method employed was inoculation of guineapigs or hamsters. Rickettsiae of Q fever were isolated from the birth fluids of 4 of the sheep. Tests of the infectivity of the fluids showed that each ml. contained a minimum of 1–10 hamster-infecting doses in the case of one sheep and a maximum of 10,000–100,000 in another. Placental tissues of 3 of these 4 sheep were examined and all were found infective. Among the placental tissues of 26 of the remaining sheep 8 were found infective so that infection was proved in 11 of the 29 placental tissues examined.

John W. D. Megaw

Ravaioli, Leonida. Infezione sperimentale del cane con *Coxiella burnetii*. [**Experimental Infection with *R. burneti* in Dogs**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1953, v. 16, Pts. 7, 8 & 9, 525–30, 1 chart. [10 refs.] English summary.

In one experiment 3 dogs were fed on yolk sacs infected with Q fever rickettsiae. Up to 6 days after feeding, but not later, it was possible to recover rickettsiae from the faeces of the dogs.

Heavier doses of infected yolk sacs were fed to 3 other healthy dogs among which in the course of a prolonged and thorough investigation the following evidence of infection was found. As in the first experiment rickettsiae were recovered from the stools 1–6 days after the feed but not later. From the blood of one dog rickettsiae were recovered on the 6th, 9th and 15th days but not later; this dog gave a positive complement-fixation reaction which did not rise above a titre of 1 in 12 in 4 tests made up to the 75th day but reached 1 in 24 on the 95th day; it also gave positive rickettsia-agglutination reactions reaching 1 in 32 on the 44th, 75th and 95th days; it was killed on the 95th day but a close investigation failed to reveal any evidence of infection in the tissues. The other 2 dogs never gave a positive rickettsia-agglutination reaction; one of them had positive complement-fixation reactions, the highest titres being 1 in 32 on the 44th and 75th days; the other gave feeble fixation reactions, the highest was 1 in 12 on the 20th day.

The author concludes that dogs may spread infection for at least 6 days after feeding on infected material such as placental tissues; they may remain potential reservoirs of infection for longer periods but no dogmatic opinion can be expressed with regard to their importance in the transmission of the disease. *John W. D. Megaw*

YELLOW FEVER

Floch, H. La fièvre jaune en Guyane française (II). Résultats de l'enquête épidémiologique de 1951. [**Yellow Fever in French Guiana (II). Results of Epidemiological Investigations made in 1951**] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 278.* 1953, Feb., 19 pp., 1 map.

Sero-protection tests, performed during 1951 on human blood samples collected from the various regions comprising French Guiana, showed that of a total of 532 examined 64 (12 per cent.) gave strongly positive, and 51 (9·6 per cent.) weakly positive results. Because of the severity of the mouse-protection test employed—that of the Pasteur Institute, Dakar—and in view of the fact that the forest region, which covers practically the entire territory, is unquestionably a zone of yellow fever endemicity, it seemed reasonable to the author to combine these findings and place the percentage of positive sera at 21·6. As a result of the survey under review it emerged that human contact with the virus of yellow fever had, at one time or other, been established along all the river basins in the territory and that such contact had occurred not only in the hinterland but also in the coastal area. In this latter connexion it has to be borne in mind that the coastal area in French Guiana, in contra-distinction to that in British Guiana or Surinam [Netherlands Guiana], is practically non-existent, the forest extending almost everywhere right down to the sea. It is also noteworthy that between the several river basins there is only equatorial forest, inhabited by numerous monkeys, particularly red monkeys (*Erythrocebus*), howling monkeys (*Alouatta stenton*) and allied species—all highly susceptible to yellow fever virus—and that these monkeys are still to be found within a few kilometres of the capital city.

It is stated that all the river basins, the hinterland and the coastal strip of French Guiana are "soaked" with yellow fever virus, which has affected all the indigenous races—Creoles, Indians and Negroes, among

whom, living as they do mainly in the forest, the percentage of strongly protective sera was found to be respectively 10 (42 among 419), 13 (4 among 32) and 22 (18 among 81).

Detailed analysis of the total positive findings revealed that, whereas 37 per cent. of these derived from sera collected in the forest areas, 17 per cent. were from sera taken from inhabitants of the coastal strip. The percentage of positives among males was higher because of their mode of life, which ordinarily brings them in closer contact with the forest vectors. Thus among 352 sera from persons over 15 years old—183 (52 per cent.) from males and 169 (48 per cent.) from females—57 were strongly protective: 41 (72 per cent.) from males and 16 (28 per cent.) from females.

Analysis further showed the inhabitants of the Maroni river basin (frontier with Surinam) to have been in contact, to the greatest extent, with the yellow fever virus: there 54 (35·76 per cent.) positive sera were found among 151 examined, as compared with 19 (11·24 per cent.) among 169 collected along the Route Nationale (Sinnamary) and with 42 (19·80 per cent.) among 212 collected from other parts of the territory. In these regions strongly positive sera were obtained to the number of 29, 13 and 22 respectively.

From investigations made after the results of sero-protection tests had been ascertained, the period during which human contact with yellow fever virus had taken place could, in certain instances, be approximately established. Thus in the case of adults of 50 to 60 years of age, among whom the percentage of positive sera was 33·3, their age had obviously permitted their contact with the virus at the time when, at the beginning of the present century, the last urban epidemics occurred in the territory. A woman of 57 years could have acquired her immunity at Cayenne in 1903. The results obtained from the sera of 7 children below the age of 15 years indicated that contact had been made within recent years. Thus, strongly protective sera were found in 4 children living in villages along the Maroni River—one of 4 years of age (born in 1947), one of 5 years (born in 1946), one of 7 years (born in 1944) and one of 12 years (born in 1939). Also, in the region of Sinnamary (7 kilometres from the town of that name) the serum of a 9-year-old boy (born in 1942) who, in common with the children referred to above, had never left his birthplace, proved to be strongly protective; in this connexion it is noteworthy that the boy's mother had died in December 1948 with symptoms highly suggestive of yellow fever. In this paper the author has included a map which, based on the results of the sero-protection tests performed, indicates the probable distribution of the localities where contact between man and yellow fever virus has taken place, and the years dating from which such contact must have been made.

The serological findings now given differ markedly from those obtained by Walcott in 1934 and recorded by Soper [this *Bulletin*, 1938, v. 35, 114]; then only 5 (2·7 per cent.) positive sera were discovered among 184 collected from a limited area on the coast; all 5 were from among 73 persons over 15 years of age living in Cayenne, where at the time the *Aëdes aegypti* index was 100 [it was still over 80 in 1945 and 1947].

Finally it is stated that in French Guiana the policy adopted for controlling the spread of yellow fever virus has been, in as large a measure as possible, that advocated by the Pan-American Sanitary Bureau: eradication of the *Aëdes aegypti*, vaccination against yellow fever, and intensive epidemiological studies. *Aëdes* eradication has been accomplished; residual spraying with DDT of all habitations in the coastal area had achieved the desired result by 1949; and by 1950 the last focus of *Aëdes aegypti* in the hinterland had been suppressed by the same means (at Souvenir, in the

heart of the territory). Immunization has been practised since 1940; for this purpose Dakar (French neurotropic virus) vaccine, administered by scratch, is preferred; facilities are offered weekly to those wishing to be vaccinated. *G. Stuart*

Reagan, R. L. & Brueckner, A. L. **Electron Microscopy of Yellow Fever Virus (17D Strain).** *Amer. J. Path.* 1953, Nov.–Dec., v. 29, No. 6, 1157–9, 1 fig.

Electron microscope studies were made of the resuspended deposits of centrifuged suspensions of the brains and cords of mice infected with 17D yellow fever virus. The photographs obtained indicated that the virus was round with slightly irregular contours and of a diameter of 50 to 55 mμ. Reagan and Brueckner suggest that the relatively large estimate of the size of the virus obtained from their studies as compared with the usual estimate of 12–19 mμ [this *Bulletin*, 1941, v. 38, 70] may be due to the fact that the virus had been carried through many passages in tissue culture and in chick embryo. [There is no evidence that the particles figured by Reagan and Brueckner are particles of yellow fever virus and not merely components of infected tissue, nor is there any evidence that viruses increase in size as a result of passage.] *G. W. A. Dick*

Pará, M. & Nugué, F. A. Viscerotomia hepática na República do Equador. [**Specimens of Liver obtained by Viscerotomy in the Republic of Ecuador**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, July, v. 5, No. 3, 223–43, 5 figs. English summary.

This article was received for publication in May 1953, but it deals with work carried out between 1934 and 1938. The viscerotomy specimens were taken in order to find out whether unexpected infections by yellow fever were occurring in Ecuador. The largest number of samples (934) were taken in the province of Guayas; next, 442, in Los Rios; 6 each in Esmeraldas and El Oro, and 3 in Manabi, 1,391 altogether. The findings are grouped under the headings of malaria, tuberculosis, cirrhosis, atrophy (including poisoning by carbon tetrachloride), drepanocytosis [sicklaemia], central necrosis, fatty infiltration and chronic passive congestion. Each of these is analysed in a series of tables, district by district, year by year, in age groups and by sex, but as regards the main object of the investigation, the discovery of yellow fever, the result was satisfactory in that no case was found. *H. Harold Scott*

RABIES

World Health Organization: Monograph Series No. 19. 275 pp. **Advances in the Control of Zoonoses. Part V. Rabies.** pp. 213–70, 3 figs. [49 refs.] WHO/FAO Seminar on Zoonoses, Vienna, Nov. 1952. 1953. Geneva: Palais des Nations. [15s.; $3.00; Sw.fr. 12.–.] [Issued also as *FAO Agricultural Studies No. 25.*] [Sales agent for U.K., H.M. Stationery Office.]

These papers form part of a larger monograph containing the principal papers and discussions arising at the WHO/FAO Seminar on Zoonoses held in Vienna in November 1952.

In the first paper, Lépine, from the Pasteur Institute in Paris, discusses natural and experimental rabies, its pathology, and the nature and properties of the virus. Vaccinal methods are briefly discussed and the author sets out the indications for treatment of human beings. Notes are given regarding incidents and accidents in treatment, and there is a short reference to the possibilities of hyperimmune serum when used in prophylaxis.

Kaplan, Chief Veterinary Public Health Officer, Communicable Diseases Services, WHO, discusses the field control of rabies. He outlines the clinical signs in the dog and the various methods of vaccination. The steps to be taken to control an outbreak of rabies are given, and there are 2 annexes, one on the control of rabies in animals, extracted from the report of the first session of the WHO Expert Committee on Rabies [this *Bulletin*, 1951, v. 48, 32] and the other on the control of rabies in foxes.

In the third paper, Lépine describes methods of diagnosis of rabies in animals, firstly in cases where a person has been bitten and secondly where there are no bitten persons. One annex describes in detail the procedure for removal of the brain of suspected animals and preparation of material for examination for Negri bodies; a second annex gives a modification of Sellers's staining method for Negri bodies; a third describes histological and other staining methods; a fourth annex deals with animal inoculation; a fifth describes at length the identification of rabies virus by the neutralization test; and a final annex discusses the determination of LD50 by cumulative-totals methods.

The discussion which followed the papers included observations on vaccination of persons bitten by suspected animals. It was stated that these measures had to be adapted to local conditions: for example in Tunisia, where the incidence of rabies is high, it was proposed that treatment should be started immediately after the bite and continued whether or not the dog developed symptoms.

The various factors concerned in the development of paralytic accidents were discussed. It was suggested that the serum-vaccine method might lessen the chance of such accidents by reducing the number of vaccine inoculations required.

It was also stated that in the United States, a single injection of potency-tested vaccine in dogs gives a high degree of protection for at least 1 to 2 years.

In addition to the review of papers, many of which have been noted in this *Bulletin* in recent years, the authors' own observations combine to provide a valuable compendium of present knowledge of rabies.

H. J. O'D. Burke-Gaffney

PLAGUE

World Health Organization. Technical Report Ser. No. 74. **Expert Committee on Plague. Second Report.** Bombay, 5–10 Dec. 1952. 13 pp. [Refs. in footnotes.] Geneva: 1953, Oct. [9d.; $0.10; Sw.fr. 0.40.]

This report gives in concise form the consensus of opinion of 10 international experts on modern methods of control, diagnosis and treatment of

plague as practised up to December 1952, when a meeting of the WHO Expert Committee was held in Bombay under the chairmanship of Sir Sahib Singh Sokhey. In a discussion on wild rodent plague it was mentioned that reports from South Africa indicated that the permanent reservoir of the disease was among these rodents whereas in Central Africa and Madagascar domestic rodents seemed to be the main reservoir. From Argentina it was reported that plague was confined to wild rodents but in Brazil the only rodents affected were domestic. Recent findings of foci of wild rodent plague in Kurdistan and Turkey suggested that these were only a part of a wide enzootic area. Although human infection has been rare in such foci the risk of spread of infection to domestic rodents needs further investigation.

Pasteurella pseudotuberculosis was said to be easily distinguished from *P. pestis* by its motility and lack of pathogenicity to rats, also by its production of urease and its constant fermentation of glycerol and rhamnose. In cases of doubt, agglutination, precipitation and bacteriophage tests are available. It appears that *P. pseudotuberculosis* has not yet been found in Central Africa, China, India, Indo-China or Madagascar.

Evidence was submitted that both living and killed vaccines were effective but the latter ought to be given in 2 doses and must contain adequate amounts of immunizing material; it has the advantage of being capable of giving protection without causing local or general reactions.

Reports from India show that streptomycin is more effective than sulphadiazine or sulphamerazine which, however, are of considerable value when given in the pre-septicaemic stage or in mild forms of the disease. The sulphonamides are also considered to have a high protective value for contacts of pneumonic plague patients and for the temporary protection of persons entering infected localities soon after being vaccinated against plague. The dosage is 3 gm. daily for 6 days. For treatment the dosage of these sulphonamides is about 10 gm. on the first day followed by smaller doses to make a total of 50 gm. during the first week.

Attention is called to the value of the recently introduced anticoagulant rodenticides. During outbreaks the essential method of control is by insecticides, of which DDT is said to be better than BHC, cyanide being less effective than either of these. The recently discovered insecticides such as aldrin and dieldrin are not mentioned, nor is the use of the newer antibiotics in treatment; these, of course, were in the experimental stage at the time of the meeting.

In an annex to the report the generally accepted methods of laboratory diagnosis are very briefly described. *John W. D. Megaw*

Lavier, G. Étude épidémiologique de la célèbre peste de Marseille en 1720. [**An Epidemiological Study of the Historic Epidemic of Plague in Marseilles in 1720**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 728–40. [10 refs.]

The author describes and discusses the surviving records of the great epidemic of plague in Marseilles in 1720. It is estimated that 40,000 persons died in the city and 10,000 in the immediate surroundings during the years 1720–21. The source of infection was a ship arriving from the Levant with plague on board; there were 8 deaths during the voyage and probably—though no mention was made of this—a high mortality among the rats. The ship was not allowed to enter the harbour; the passengers and the cargo of costly silk and cotton goods were disembarked and kept in

quarantine, the former for 20 days and the latter for 40 days. Although deaths continued to occur on the ship and among the persons engaged in handling and guarding the goods the existence of plague was not admitted and the deaths were persistently attributed to bad food. The author finds evidence which convinces him that the quarantine of the cargo was a farce and that with the connivance of persons in authority the bales of cloth were to a large extent smuggled into the city where the first persons to be attacked were the families of tailors and of a notorious smuggler. It was not till nearly 2 months after the arrival of the ship, by which time several deaths had occurred in the city, that a doctor notified the authorities that he had seen several undoubted cases of plague and the occurrence of the disease in the city was officially recognized.

The author insists that all the evidence points to transmission from man to man rather than from rat to man; there was no mention of deaths among rats, and the spread of infection in the city and afterwards throughout the south of France was by leaps, often to places at a great distance leaving intermediate areas free from attack. Religious communities in Marseilles and elsewhere escaped and so did certain areas round which an effective sanitary cordon was maintained; for example, one town whose ramparts were constantly " manned " by women to prevent the entry of any outsider. Drastic action was taken to protect unaffected areas even to the extent of digging trenches round infected localities and guarding these with troops who shot at sight anyone attempting to cross the barrier; persons caught after breaking through were shot or hanged, and altogether several hundreds of people were killed in the course of these preventive measures. The complete disappearance of the disease from affected regions was another feature which favours the view that transmission was solely by human being and their ectoparasites.

The paper should be read by everyone interested in the history of plague: it has little bearing on the epidemiology and control of the disease in modern conditions. *John W. D. Megaw*

Pollitzer, R. Classification de la peste par des méthodes biochimiques. État des connaissances et orientation des recherches futures. [**Classification of Plague by Biochemical Methods**] *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 655–64. [40 refs.]

This is a critical review of the literature dealing with the classification of the varieties of *Pasteurella pestis.* The bibliography has 40 references. The information available points to the existence of 2 well defined races; (a) the glycerol-acidifying continental race found in central and north-western Asia, and (b) the glycerol-negative oceanic race which occurs in areas where plague has been introduced in recent times by the sea route.

A list is given of 34 countries or areas from which reports have been made showing the numbers of glycerol-positive and glycerol-negative strains that have been isolated. These reports, on the whole, strongly support the classification but there are many countries from which no information on the subject has been supplied. The author recommends that a systematic survey should be undertaken under the auspices of WHO in existing laboratories or in regional laboratories specially designated for the purpose. Technical methods are described which are recommended as suitable for general adoption.

Reference is also made to the classification of *P. pestis* proposed by

Devignat [see this *Bulletin*, 1952, v. 49, 45]. In this, 3 varieties are recognized having the distinguishing features shown in the table:

	Glycerol fermenting	*Nitrous acid producing*
P. pestis orientalis	−	+
P. pestis antiqua	+	+
P. pestis mediaevalis	+	−

The author believes that an investigation of the geographical distribution of the different strains may be of practical importance in giving a clue to the regions in which the principal foci of infection occur.

John W. D. Megaw

Girard, G. Méthodes permettant de différencier *P. pestis* de *P. pseudotuberculosis*. Possibilité d'uniformiser ces méthodes. [**Methods of Differentiating** *Pasteurella pestis* **from** *P. pseudotuberculosis*] *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 645–53.

The author has studied 98 strains of *Pasteurella pestis* of which most were of the *oceanic* type, but 29 were of the *mediaevalis* and 9 were of the *antiqua* type [this *Bulletin*, 1952, v. 49, 45]; he also studied 40 strains of *P. pseudotuberculosis* of which 3 were of human origin; the rest had been isolated from various rodents and birds except 1 which came from a pig.

In practice the differentiation of *P. pestis* from *P. pseudotuberculosis* is said to be easy by the methods described, but the author recommends the adoption of a standard plan based on (1) the stab-culture test for motility of *P. pseudotuberculosis*, (2) a test for the production of urease from urea, (3) a test for the fermentation of glycerol, and (4) the rhamnose fermentation test. Clear instructions are given for carrying out these tests all of which are ordinarily negative with *P. pestis*.

An appeal is made for an investigation in all areas in which plague is endemic or enzootic to find which of them are foci of *P. pseudotuberculosis*.

John W. D. Megaw

Devignat, R. & Boivin, A. Deux milieux complexes pour la différentiation des trois variétés de *Pasteurella pestis*, et de *P. pseudotuberculosis*. [**Two Complicated Media for the Differentiation of the Three Strains of** *Pasteurella pestis* **and of** *P. pseudotuberculosis*] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 627–31.

The two complicated media described in this paper have been elaborated and tested by the authors, who claim that they facilitate the rapid and certain differentiation of the 3 varieties of *Pasteurella pestis* and the differentiation of these from *P. pseudotuberculosis*.

The composition, mode of preparation and employment of media, and a key to the interpretation of the findings obtained, are stated so succinctly that the paper cannot usefully be summarized.

The first medium contains glycerin, rhamnose and nitrate of potash; it consists of solid agar slopes and in most cases it suffices for the differentiation of all the above strains. In doubtful cases the second medium is also employed; it is a semi-solid medium containing urea and inulin and is used for making stab cultures which give a clear indication of the motility of *P. pseudotuberculosis* and so serves to differentiate this organism from all the strains of *P. pestis*; the motile organisms grow out from the line of

the stab in the form of thread-like opacities whereas the non-motile *P. pestis* is restricted to the line of the stab and does not grow out into the surrounding medium.

John W. D. Megaw

Davis, D. H. S. **Plague in Africa from 1935 to 1949. A Survey of Wild Rodents in African Territories.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 665–700, 15 figs. (1 folding). [47 refs.]

This is a critical review of the history of plague in Africa during the period 1935–49; it is based largely on the official replies of the Governments of the different countries to a questionary issued in 1950 by the WHO. The replies are said to have supplied information of great value on the plague position since 1935 when a detailed report of the findings of a committee of the *Office International d'Hygiène Publique* was written by R. Jorge [this *Bulletin*, 1936, v. 33, 357]; this dealt fully with the history of the disease in Africa up to that time. The factual information acquired in the present survey is contained largely in 14 tables and 15 figures of which the most important is a map showing the localities in which human plague has occurred between 1899 and 1939, and by distinctive symbols the places affected between 1940 and 1949. Separate symbols show whether domestic or wild rodents are regarded as having been the main reservoir of infection. Only one true wild-rodent plague area is recognized—that is southern Africa. Localities in which domestic-rodent and wild-rodent foci occur together are said to be restricted to the Union of South Africa. On the other hand references are made to reports of the occurrence of wild-rodent plague in the Belgian Congo, Tanganyika, Senegal, Kenya and Uganda, but with regard to the last 2 places it is stated that conclusive proof that the wild rodents make any significant contribution to the maintenance of the plague reservoir has been lacking. There is, however, a footnote in which it is stated that recent studies by Heisch in Kenya indicate that wild rodents were involved in certain outbreaks along with domestic rodents. The reports of Heisch on wild-rodent plague in Kenya [see this *Bulletin*, 1953, v. 50, 110, and 1954, v. 51, 264] seem to prove that definite foci of wild-rodent infection occur in Kenya. The author rightly stresses the need for further investigation into the wild-rodent plague problem in Africa.

[In view of the rapid fall in the number of cases of plague in Africa, from 6,765 cases in 1935 to 329 in 1949, and the absence of reports of the disease from North Africa since 1949, it seems likely that the wild-rodent reservoirs of infection may soon constitute the real plague problem of the greater part of Africa.]

The largest section of the paper deals with the influence of climate on the transmission of plague and the conclusion reached is that the conditions known to favour transmission in India are much the same in Africa. The references in the literature to the vectors and hosts concerned in transmission are briefly stated, and altogether the paper serves as a valuable introduction to the study of plague in Africa and Madagascar.

John W. D. Megaw

Davis, D. H. S. **Plague in South Africa: a Study of the Epizootic Cycle in Gerbils** (*Tatera brantsi*) **in the Northern Orange Free State.** *J. Hygiene.* 1953, Dec., v. 51, No. 4, 427–49, 3 text figs. & 4 figs. on 2 pls. [18 refs.]

This is a description of a detailed field study of a major epizootic outbreak of plague among gerbils (*Tatera brantsi*) in an area of about 120 square

miles in the northern part of the Orange Free State. Plague had been known to occur in enzootic form in the area since about 1922 when it was thought to have been introduced by the immigration of infected gerbils. A series of human outbreaks occurred in 1924, and again in 1938–39 there were 3 human outbreaks, 2 of which occurred in the same farm, the interval between them being nearly 2 years. In January 1940 it was found that an epizootic was impending in the area and a preliminary survey was made in which 34 gerbil colonies of varying size were found; the average distance between them was 1–3 miles; 18 occurred round farmsteads or on maize threshing floors, 12 were on open grass veld which had never been cultivated and 4 were on land lying fallow between maize crops.

The systematic census of the gerbil population was started in June 1940, when it was found that most of the colonies were declining and that 13 of them had already been exterminated by the disease. By January 1941 very few of the gerbils survived. During the next 18 months surveys were made of each colony at intervals of 3 months and a gradual increase in the number of the gerbils was observed. In some of the colonies the process of extinction was slow, *Pasteurella pestis* being detected 4–6 months before the last gerbil died. In some cases the colonies maintained their numbers for several months after deaths from plague had begun to occur.

Later reports of routine departmental surveys of the area from 1942 to 1951 showed that the gerbil population never regained its original strength; short periods of increase in the colonies were followed by periods of decline. During these years 6 cases of human plague occurred in the area in the years 1943, 1946, 1948 and 1949; 4 different farms were affected. Ten strains of *P. pestis* were isolated from rodents and their fleas at the times of these outbreaks. Spread of infection from the affected colonies was seldom observed but the following examples are given of natural transmission from one rodent to another:—(1) from *Tatera* to *Rattus*, (2) from *Tatera* to *Mastomys*, and (3) from *Rattus* to *Mastomys* and from this to *Tatera*. In the last case the reversal of the normal sequence was " all but proved ".

Although plague among domestic rodents was regarded as the main source of human infection it was considered to be of secondary importance in maintaining the reservoir.

Living plague-infected fleas were sometimes found in deserted gerbil burrows which had been blocked for as long as 4 months; this finding confirms the view that fleas may be more important than wild rodents in carrying over infection in inter-epizootic periods; the flea chiefly concerned was believed to be *Xenopsylla philoxera*.

This interesting paper conveys a clear impression of what may happen in an epizootic of wild-rodent plague in an area where the disease is enzootic. Full details of the survey will be found in the paper.

John W. D. Megaw

DE LA BARRERA, J. M. Rongeurs sauvages infectés par *Pasteurella pestis* en Argentine. [**Wild Rodents Infected with** *Pasteurella pestis* **in Argentina**] *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 701–5.

The wild rodents found infected with plague in Argentina are concisely described. The information given with regard to each species includes its geographical distribution, habitat, habits, the fleas commonly occurring as ectoparasites and the part played in transmission of plague to man. Among the 17 species listed the following are the most important:—

(1) three species of Caviidae of which *Microcavia* [*?Caviella*] *australis* and *Galea musteloides* have often been found infected in epizootic outbreaks;
(2) ten species of *Cricetidae* of which 2 varieties of *Graomys* and 4 species of *Hesperomys*, 2 species of *Eligmodontia* and *Holochilus balnearum* are examples. *John W. D. Megaw*

Sokhey, S. S., Wagle, P. M. & Habbu, M. K. **Treatment of Bubonic Plague with Sulfonamides and Antibiotics.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 637–43. [13 refs.]

The chief conclusions reached by the authors have already been stated in the abstract dealing with the report of the committee [see above, p. 373]. The paper includes a report of trials on mice of aureomycin, chloramphenicol and oxytetracycline, given by the mouth; these gave promise of being very effective when given in adequate doses. If given for an inadequate number of days there was apparent cure followed by relapse. *John W. D. Megaw*

Meyer, K. F. **Recent Studies on the Immunity Response to Administration of Different Plague Vaccines.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 619–36. [12 refs.]

The author describes an important experimental study of the degree of immunity conferred by inoculation with various types of antigens of *Pasteurella pestis*. He found that in mice immunized by the potent water-soluble envelope antigen called Fraction I there was an obvious association between the antibody titres and the degree of immunity following inoculation, whereas among guineapigs the results were variable. He also found that primates were rendered resistant to massive doses of living *P. pestis* by the doses of various types of vaccine corresponding to those ordinarily given to human beings. The quantity of Fraction I administered was the crucial point both in primates and human volunteers, doses of 2–3 mgm. given subcutaneously in the form of a killed vaccine or doses of an avirulent living vaccine capable of producing the same amount of Fraction I by multiplication in the body " will favourably alter the susceptibility of 50% of inoculated persons ". This basic immunity may increase at the end of a month and last at least 6 months. To increase the percentage of the persons protected and increase the moderate degree of immunity conferred by the initial vaccination re-inoculations at intervals of 3–6 months are needed. Inoculation first applied in the presence of an epidemic will rarely protect more than 40–50 per cent. of the inoculated during the first month. Re-inoculation after 3 months greatly increases the percentage of protected persons and annual re-vaccination progressively increases the immunity of a population.

There is no convincing proof that living plague vaccines may prove superior to Fraction I antigens.

On the other hand there is equally encouraging evidence that a live vaccine prepared from strain EV 76 is an excellent immunizing agent, but in the customary dose the systemic reactions in volunteers were unduly severe; 2 out of 12 persons vaccinated had a temperature of 100°F. for 120 hours and at least one-half of the group were incapacitated for 72 hours.

The committee in commenting on this paper stressed the view that the carrying out of vaccination during the off-season was an essential second line of defence against bubonic plague. *John W. D. Megaw*

Link, V. B. & Mohr, C. O. **Rodenticides in Bubonic-Plague Control.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 585–96.

This and 8 other abstracts deal with papers submitted to the meeting of the WHO Expert Committee on Plague held at Bombay in December 1952. The report of this meeting has been the subject of an abstract [see this *Bulletin*, above, p. 373], and the views of the authors of most of the papers have already been published in articles reviewed in this *Bulletin*.

The present paper, submitted for publication in June 1953, contains an authoritative description of the rodenticides considered most valuable in plague control. The following table shows the opinions of the authors with regard to the order of preference of each poison from the point of view of safety and effectiveness.

Rodenticide	*Recommended strength, by weight*	*Relative safety*	*Relative effectiveness*
Warfarin	0·025%	2	2
Red squill	5–10%	1	7
ANTU	2–3%	3	6
Zinc phosphide ...	1%	4	5
Arsenic trioxide ...	3%	5	4
Thallium sulphate ...	0·5%	6	3
Sodium fluoroacetate...	0·32%	7	1

Although Warfarin easily takes first place in the competition for combined safety and effectiveness, the authors qualify their judgment by stating that " time and extensive field application will determine its true value ". Reference is made to a recently released water-soluble form of Warfarin which can be used instead of, or in addition to, the solid bait.

John W. D. Megaw

Wagle, P. M. & Seal, S. C. **Application of DDT, BHC, and Cyanogas in the Control of Plague in India.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 597–614. [13 refs.]

The authors give a summary of the excellent results obtained in plague control in various parts of India by DDT, which has superseded fumigation with Cyanogas and is considered preferable to BHC because of its lasting effects. The importance of continuing to employ disinfestation of rat burrows and nesting places during interepidemic periods is mentioned and stress is laid on the necessity for rat control by rodenticides.

John W. D. Megaw

Sáenz Vera, C. **DDT in the Prevention of Plague in Ecuador.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 5, 615–18.

The author describes the remarkable success that has followed the adoption of DDT powder, applied by a powerful pump to the burrows of rats and by dusting on the floors, walls, beds and clothing, in the control of plague in Ecuador. The greatest success has been achieved in rural areas, but unfortunately since 1950 there has been a progressive increase in the development of resistance to DDT among fleas in certain localities. The present communication is merely a preliminary note on the subject which is being studied with a sense of urgency.

[Presumably the action of the newer and more powerful insecticides on

resistant fleas is being studied and it seems likely that the thorough application of DDT combined with and followed up by energetic rat control with a rodenticide such as Warfarin, and by rat-proofing, would lessen the risk of survival of strains of resistant fleas.] *John W. D. Megaw*

CHOLERA

CHATTERJEE, H. N. **Therapy of Diarrhoea in Cholera.** [Correspondence.] *Lancet.* 1953, Nov. 14, 1045–6, 1 fig. [12 refs.]

In this letter Chatterjee recommends the administration of the juice of a plant common in Bengal, *pathorchur* (*Coleus aromaticus*) in the treatment of the diarrhoea in cholera. He recommends an initial dose of 4 drachms followed by doses of 2 drachms at hourly intervals for 3 doses. If at the end of 8 hours diarrhoea continues the dosage should be repeated in the evening and on subsequent days. Of 200 cases the diarrhoea was checked within 24 hours in 40 per cent., within 48 hours in 74 per cent. and within 72 hours in 92·5 per cent. Of 40 controls given kaolin suspension instead of pathorchur juice, diarrhoea was checked within 24 hours in only 5 per cent., within 48 hours in 12·5 per cent. and within 72 hours in 30 per cent. With this juice therapy, rough colonies appeared in stool culture in 24 hours with an increase in the proportion of rough to smooth colonies in successive cultures—the smooth colonies being scanty or absent in the 5th or 6th cultures. In the controls smooth culture preponderated up to the 12th culture. The mortality rate was 8·5 per cent. with leaf juice therapy and 20 per cent. among the control cases. The use of Avomine [see below] plus the exhibition of antihistamines and vitamin C made it possible to dispense with parenteral and intravenous administration of fluids in a substantial number of patients who would otherwise have required it.

G. R. McRobert

CHATTERJEE, H. N. **Control of Vomiting in Cholera and Oral Replacement of Fluid.** *Lancet.* 1953, Nov. 21, 1063.

Since 1952 Chatterjee has been using Avomine (a proprietary preparation containing promethazine base and 8-chlorotheophylline in chemical combination) to check vomiting in cases of cholera. Of 100 cases, one tablet stopped vomiting completely in 41, 2 tablets in 30 and 3 tablets in 18. In more resistant cases up to 6 tablets were given to stop this distressing and dangerous symptom. Chatterjee finds that the control of vomiting with Avomin makes it possible to relieve the extreme thirst of patients and to replace water and electrolytes by mouth. In mild cases (blood sp.gr. 1062 or less) fluids were required by mouth only; in moderately severe cases oral and rectal routes were employed. Of 186 cases treated with Avomine 33 were mild and 153 were moderately severe. All of the patients recovered. Avomine does not stop diarrhoea. The combination of Avomine with *Coleus aromaticus* [see above] enabled patients with mild or moderately severe cholera to achieve convalescence without intravenous or other parenteral therapy.

In the series Avomine was given only to the 186 patients (17 per cent. of the total admitted with cholera) who seemed likely to benefit.

[The clinical condition of patients admitted to hospital in the same

epidemic varies to an almost incredible degree—one patient being ambulant and hardly ill while his neighbour is struck down and dies within an hour or so. Dr. Chatterjee's results in mild cases are gratifying but a series of more severe cases should be reported on. In the abstracter's experience it may be quite impossible for a patient with severe cholera to retain a single pill for even a few seconds.] *G. R. McRobert*

Chakravarti, H. S., Mondal, A., Das, A. & Chaudhuri, R. N. **Vitamin C and Antihistaminics in the Treatment of Uraemia in Cholera.** *Indian Med. Gaz.* 1953, Oct., v. 88, No. 10, 527–9.

Seventy-eight cases of cholera were studied. The patients were divided into 3 groups of 50, 12 and 16. In the first group vitamin C (Redoxon) 500 mgm. was given intravenously with the first saline infusion to 25 patients. The same dose was repeated if anuria or oliguria persisted for more than 12 hours. If anuria lasted for more than 24 hours Antistin 2 ml. was injected intramuscularly and this dose was repeated, as was the dose of vitamin C, every 12 hours until death or recovery. Alternate patients (controls) received saline only. One treated patient became uraemic; 2 control patients died of circulatory collapse.

In the second group vitamin C 500 mgm. plus Antistin 2 ml. was administered every 12 hours if oliguria or anuria had persisted for 2 to 3 hours after the first saline infusion. Only one patient in this group became uraemic.

The third group consisted of 16 patients who developed uraemia while being treated for cholera. In addition to standard treatment alternate patients were given the doses of vitamin C and Antistin quoted above. Five died. In the untreated control group, 6 died.

The results in all 3 groups indicated that neither vitamin C nor the antihistaminic had an effect on the prevention or treatment of uraemia in cholera. The régime of treatment had no effect on shocked patients.

B. G. Maegraith

Gohar, M. A. **Sensitivity of the Cholera Vibrio to Antibiotics.** *J. Trop. Med. & Hyg.* 1953, Dec., v. 56, No. 12, 289–94. [11 refs.]

The comparative activities of certain antibiotics and sulphonamides against *V. cholerae* were determined by *in vitro* and by *in vivo* methods, as a possible guide to selection for trial in treatment of cholera. The antibiotics tested were dihydrostreptomycin, chloramphenicol, aureomycin and terramycin [oxytetracycline]; the sulphonamides were sulphadiazine, sulphaguanidine, sulphasuxidine and "Formocibazole". A mixture ("Trulfamycin") of dihydrostreptomycin, sulphadiazine, sulphamerazine and sulphamethazine was also tested.

Bacteriostatic action in vitro: The 4 antibiotics were found to have a more potent action than the sulphonamide compounds, chloramphenicol and dihydrostreptomycin being the most active. The minimum bacteriostatic concentrations of chloramphenicol and sulphadiazine, for example, were found to be, respectively, 1 to 4 μgm./ml. and 150 to 500 μgm./ml. The sulphonamides showed a slight synergic action on dihydrostreptomycin.

Bactericidal action in vitro: Of the drugs only dihydrostreptomycin and Formocibazole showed appreciable bactericidal action on the cholera strain used. A concentration of 250 to 500 μgm./ml. of dihydrostreptomycin killed the vibrio in less than 5 minutes and a concentration of 30 to 60 μgm./ml. in about 1 hour. Formocibazole killed in a concentration of 10,000 μgm./ml. in 1 hour.

The vibrio readily acquired resistance to dihydrostreptomycin on serial transfer in media containing the antibiotic. A lesser degree of resistance to chloramphenicol developed and only slight resistance to aureomycin and oxytetracycline.

Tests in vivo: These were carried out in guineapigs infected orally after neutralization of the gastric juice and intraperitoneal injection of tincture of opium, to immobilize the intestines. Administration of the drug was by the oral route and the assessment of the results was based on the determination of the number of vibrios present in the stools at a series of successive examinations. Three methods of administration of the drugs were employed: (a) in the 24 hours before infection only, (b) daily for 5 days commencing immediately after the infection, and (c) commencing from 24 hours after infection.

Treatment given only during the 24 hours immediately preceding infection had no appreciable effect. When commenced at the time of infection, treatment with chloramphenicol, dihydrostreptomycin, a mixture of dihydrostreptomycin and 3 sulphonamides or a mixture of dihydrostreptomycin and sulphasuxidine gave the best results, the stools being practically free from vibrios for the 5 days over which treatment was carried out. Treatment commenced 24 hours later was less effective.

On the basis of these results dihydrostreptomycin alone or in combination with sulphaguanidine or sulphasuxidine is recommended for trial in treatment of cholera. Points taken into account in recommending dihydrostreptomycin are its bactericidal as well as bacteriostatic action and lack of absorption from the intestine. *J. Taylor*

Nagao, I. **Comparative Study of Roseomycin, Streptomycin, Chloramphenicol and Homosulfanilamide on the Effect of Experimental Cholera Infections.** (Studies on the Antibiotic Substances from *Actinomyces*, 13th Report.) *Tohoku J. Exper. Med.* 1953, Aug. 25, v. 58, No. 2, 191–4.

In the Department of Bacteriology of Tohoku University, Japan, " a new basic streptothricin-like, but non-toxic substance " has been isolated from a strain of *Streptomyces roseochromogenus* and given the name of " roseomycin ".

Experiments are briefly described in which " roseomycin " was tested *in vitro* against 10 strains of *V. cholerae* by serial dilution on plates and was also tested *in vivo* by subcutaneous infection of mice which had been infected intraperitoneally with culture of *V. cholerae* an hour previously. Similar tests were carried out with streptomycin, chloramphenicol, and two sulphonamides for comparison.

The results, which are shown in 2 tables, indicate that *in vitro*, the order of effectiveness of the drugs was: chloramphenicol, roseomycin, the sulphonamides and streptomycin. Chloramphenicol was effective at 12·5 μgm. per ml. and roseomycin at 25 μgm. per ml.

In experimental infections, these last-named two drugs were effective in a dose of 0·5 to 1 mgm. against an infection of 10^{-2} mgm. of *V. cholerae* given intraperitoneally. The tables show that at this dosage, 4 of 5 mice usually survived, while up to 4 of 5 died when the other drugs were used and 19 of 20 died among untreated controls. *H. J. O'D. Burke-Gaffney*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

SAITO, M. **Cultivation of *Entamoeba histolytica* without Actively Growing Bacteria. I. Cultivation in the Preconditioned Medium added with Antibiotics.** *Kitasato Arch. Exper. Med.* 1953, May, v. 25, Nos. 3/4, 245–52. [16 refs.]

The author describes experiments designed to produce conditions under which *Entamoeba histolytica* could be cultivated without living bacteria. The media used were (1) his RSR, consisting of horse serum + Ringer's solution slant overlaid with Ringer's solution, and (2) Balamuth's egg yolk infusion.

The first step was to find a method for killing the concomitant bacteria with antibiotics. It was found that chloramphenicol added to the media in concentrations above 50 μgm./ml. (RSR) and above 25 μgm./ml. (Balamuth's) inhibited the growth of both bacteria and amoebae, whereas at lower concentrations the amoebae survived but their multiplication was retarded. It was thought that the addition of reducing substances would lower the redox potential, thereby promoting better growth of the amoebae. To test this, a medium of the following composition was used: egg yolk infusion 100 ml., *l*-cysteine HCl 200 mgm., sodium thioglycollate 50 mgm., methionine 20 mgm., with methylene blue as indicator (*p*H 7·0). To tubes containing this mixture were added rice powder, and various concentrations of chloramphenicol, chloramphenicol + penicillin, or streptomycin + penicillin, after which they were inoculated with amoebae. After 48 hours, in all the cultures with streptomycin (0·75 to 5·0 mgm./ml.) + penicillin (1,000 u/ml.) the amoebae were active; in those with chloramphenicol alone or with penicillin (1,000 u/ml.) the amoebae were active in 100 μgm./ml. concentration of the former, but died in higher concentrations.

For the cultivation of *E. histolytica* without living bacteria, the successful procedure was as follows: (1) rice flour was added to the medium and this was inoculated with the bacteria accompanying the strain of amoebae; (2) after incubation for 18–20 hours, the medium was overlaid with liquid paraffin and the tubes were incubated for another 4–6 hours; (3) the bacteria were inactivated by heating the cultures at 56°–58°C. for 2 hours; (4) horse serum (10 per cent. in volume) and streptomycin + penicillin were added. The concentration of the antibiotics in the 2 media was as follows: streptomycin 3·0–10 mgm./ml. for RSR and 2·5–3·0 mgm./ml. for Balamuth's; penicillin 1,000 u/ml. and 3,000–5,000 u/ml., respectively. In both media *E. histolytica* grew rapidly without living bacteria, the absence of which was confirmed by subinoculation into suitable media. Subcultures of the "bacteria-free" amoebic cultures were carried out in preconditioned media up to 10–11th transfer, after which cultivation was discontinued. However, attempts to establish such cultures in media without previous "seeding" and inactivation of bacteria failed. It was also shown that while the amoebae cultivated with inactivated bacteria grow readily when subinoculated in media containing a single living bacterial species (*e.g.*, *Bacterium coli*), they would not grow in media preconditioned with inactivated bacteria of this species alone. *C. A. Hoare*

SAITO, M. **Cultivation of *Entamoeba histolytica* without Actively Growing Bacteria. II. Cultivation in the Media preconditioned with Pure Strains of Bacteria.** *Kitasato Arch. Exper. Med.* 1953, May, v. 25, Nos. 3/4, 253–61. [26 refs.]

Having previously shown (above) that *Entamoeba histolytica* is capable of growing in the absence of living bacteria, the author carried out experiments

on the cultivation of this amoeba in a medium preconditioned with one or two of the following species of bacteria: *Staphylococcus*, *Streptococcus*, *Bacterium coli* (*coli* and intermediate types), *Bact. alkaligenes*, *Clostridium tetani*, *C. welchii*. The medium used was Balamuth's egg yolk infusion with 0·5 per cent. peptone, and its preconditioning followed the procedure described in the first paper (above). The results were as follows: *Bact. coli* and *Bact. alkaligenes* supported the growth of amoebae in the primary culture but they failed to grow in subcultures. The amoebae did not grow in cultures preconditioned with *Streptococcus*, *Staphylococcus* or *Clostridium tetani*, but when the latter was combined with *Bact. coli* the amoebae grew well through several subcultures. However, luxuriant development of the amoebae, with indefinite subcultures, was obtained in the presence of inactivated *Clostridium welchii*. *C. A. Hoare*

Cole, B. A. & Kent, J. F., with the technical assistance of V. A. Lopez. **Immobilization of** *Endamoeba histolytica in Vitro* **by Antiserum produced in the Rabbit.** *Proc. Soc. Exper. Biol. & Med.* 1953, Aug.–Sept., v. 83, No. 4, 811–14, 2 figs.

The authors describe experiments designed to ascertain whether animals infected (or injected) with *Entamoeba histolytica* are capable of producing an antibody which immobilizes the amoebae.

The test organisms were represented by 20–24-hour cultures of the amoeba with a concomitant mixed flora, 0·5 ml. amounts of which were pooled in a test tube, which was incubated at 37°C. for 3 hours. The number of amoebae used for the test was standardized at 2×10^5 per ml. For immunization, 48-hour cultures of *E. histolytica* growing with *Trypanosoma cruzi* were washed 3 times in saline and centrifuged (10 minutes at 500 *g*), after which they were suspended in saline. Rabbits were then injected intravenously with 0·5 ml. of amoebic suspension 3 times weekly for 3 weeks. They were bled by cardiac puncture 7–10 days after the last injection, then the sera were separated and stored at −20°C.

For the immobilization tests, 0·05 ml. of the standard amoebic suspension was mixed on a slide with an equal volume of the serum to be tested. The preparation was then sealed under a coverslip, and examined microscopically on a warmed stage at 37°C. The number of motile amoebae among the first 25 was recorded. The estimate of the percentage of amoebae immobilized by the antiserum was made by subtracting the number of motile amoebae in the test preparation (A) from the number of motile ones in the control with normal serum (B), and multiplying the difference by 100/B.

It was found that the sera of rabbits thus treated invariably immobilized *E. histolytica in vitro*. Moreover, in preliminary tests with 13 patients suffering from amoebiasis, the sera of 5 likewise reacted positively.

C. A. Hoare

Anderson, G. V. W. **Surgical Complications of Amoebiasis.** *East African Med. J.* 1953, Nov., v. 30, No. 11, 467–73. [23 refs.]

The manifestations of amoebic disease are most marked in the caecum and ascending colon, less in the pelvic and sigmoid colon and still less elsewhere. Consequently the most frequent clinical signs—thickening and tenderness of the bowel—are to be detected in the right and left hypogastric regions. The disease may occur in the following forms:—

Acute or subacute inflammation in the right iliac fossa, so-called amoeboma of the caecum and ascending colon, often involving the appendix in the mass, and with a leaking perforation into the peritoneum. It is dangerous to remove the appendix in these cases, which are often diagnosed as appendicitis, as the stump cannot be securely closed on account of rigidity and friability of the bowel wall. In these cases there is little or no pus in the peritoneal fluid which is copious and sanious, and there are few localizing adhesions.

So-called chronic appendicitis: Here a past history of an acute attack of amoebic dysentery should warn against removal of the appendix. One should never be satisfied by negative stool examination and negative sigmoidoscopy that amoebae are not present. Although the caecum and ascending colon are the most frequent sites of entamoebic infection and even the lower end of the ileum, yet the appendix itself is rarely involved. In women and girls disease of the tube and ovary on the right side is a source of confusion, and diseased conditions in lymph glands, ureter, caecum and descending colon must be excluded.

Haemorrhage in sufficient quantity to threaten life is rare, but may need operation for its arrest as a life-saving measure.

Perforations have a high mortality; they may be a single or multiple and are associated with the acute dysenteric form of the disease. The condition of the patient is poor and the state of the bowel is such that repair is difficult. Theron [this *Bulletin*, 1947, v. 44, 1002] and James (*Proc. Roy. Soc. Med.*, 1946, v. 39, 766) suggest treatment by a defunctioning ileostomy, for which a 50 per cent. recovery rate is claimed. A localized abscess is the most hopeful outcome.

Rectal amoebiasis: The acute ulcers are irregular in shape with undermined edges and may be multiple. Another type, more frequent in the chronic cases, is a minute crater on top of a papule. The third form is an amoeboma, characterized by a swelling on one side of the rectum with ulceration and proliferation of the mucosa, resembling carcinoma. In such cases a biopsy is essential, even though amoebae may be found in the stools. Simple stricture of the rectum is not likely to be due to amoebiasis. A fistula or a fissure ulcerating at its orifice may be tuberculous but can be amoebic.

Skin: Serious ulceration of the abdominal wall following operations on amoebic disease of the colon, not recognized as such, has been reported. Lesions are found around the anus or around the fistula communicating with the bowel and may be mistaken for phagedaenic ulcers.

Partial or complete obstruction is usually caused by an amoeboma, which may occur at more than one point and may simulate carcinoma or Crohn's disease. The effect of emetine is so rapid that the need for dealing with the obstruction otherwise than by gastric and intestinal suction does not arise.

Intussusception is usually caused by an amoeboma in or around the mobile caecum found in children.

Liver abscess and amoebic hepatitis are not so common nowadays as they were formerly. The author warns against the use of a needle of too fine a bore for exploratory puncture, which should be done in that area of the liver which seems by percussion to be most closely applied to the chest wall. Fifteen per cent. of these abscesses occur in the left lobe, a region in which exploratory puncture should not be attempted.

[See also abstract of a paper on the same subject by Hawe, this *Bulletin*, 1946, v. 43, 134.]

W. L. Harnett

Basnuevo, J. G., Gutiérrez Estarlí, E., Cowley Chávez, O., Blanco Rabassa, E. & Soler Delgado, F. Terapéutica actual de la amibiasis. [**Present Treatment of Amoebiasis**] *Rev. Kuba Med. Trop. y Parasit.* 1953, Jan.–June, v. 9, Nos. 1/6, 20–27. [30 refs.]

A review of the subject in Spanish.

Malewitz, E. C. **Leukopenia following Fumagillin Treatment for Amebiasis.** Report of a Case. *J. Amer. Med. Ass.* 1953, Dec. 19, v. 153, No. 16, 1446.

"A case of mild leukopenia following treatment of amebiasis with fumagillin is reported. Since this is a rare occurrence, further trial of this apparently well-tolerated and effective drug is justified, but sensitivity should be suspected and proper precautions taken."

See also p. 421, Crosnier *et al.*, Filariose *Loa* et amibiase, incidences du traitement par la Notézine. [**Loiasis and Amoebiasis: Episodes in Treatment with Diethylcarbamazine**]

Yokogawa, M., Wykoff, D. E. & Ritchie, L. S. **Mass Treatment of *Endamoeba histolytica* Carriers.** *U.S. Armed Forces Med. J.* 1953, Dec., v. 4, No. 12, 1776–7.

It has been estimated that about 10 per cent. of Japanese harbour *E. histolytica*. In this paper, an account is given of the treatment of 124 such persons selected from 2 villages in Yamanashi Prefecture. In each case 5 concentration examinations of faeces were made and repeated 5 weeks and 7 months after treatment.

The drugs used were carbarsone for one week, followed by chiniofon in the second week. The dose of carbarsone was 0·25 gm. given once daily to those aged 3 to 6, twice to those of 7 to 11 and thrice daily to those aged 12 or over. In the case of chiniofon the dosage at each of these three ages was 0·25, 0·50 and 0·75 gm., respectively, thrice daily. Patients were interviewed every 3 days and those who had not taken the drug were discounted. Altogether, 106 persons were followed up: only one was still infected 5 weeks after treatment and 4 (3·8 per cent.) after 7 months.

It is stated that this indicates a high level of therapeutic efficiency. The authors suggest that the dosage may have been comparatively large, because of the small stature of the Japanese, but point out that comparable results were obtained with carbarsone and diodoquin in the Mantetsu epidemic in Tokyo in 1947 [this *Bulletin*, 1949, v. 46, 548].

Comparison of results in the 2 villages in January (before treatment) and the following September showed that the incidence of *E. histolytica* in one village was 28·8 per cent. in January and 4·1 per cent. in September. In the other village, the figures were 13·5 and 2·2.

The authors stress that the ultimate benefits of mass treatment will depend on how quickly reinfection occurs. *H. J. O'D. Burke-Gaffney*

Veghelyi, P. A propos de la lambliase et de stéatorrhée. [**Giardiasis and Steatorrhoea**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1953, Nos. 26/27, 896–7. [14 refs.]

The author refers to the paper of Roch and Lasserre [this *Bulletin*, 1953, v. 50, 712] and points out that the association of giardiasis and steatorrhoea is not a new observation. He has himself on a number of occasions during

the last 15 years referred to interference by *Giardia* with absorption and to the fact that the associated steatorrhoea clears up as soon as the parasites are expelled [see, for example, this *Bulletin*, 1940, v. 37, 375, 376, 870; 1949, v. 46, 1148]. He also notes that the phenomena in question are cited in a number of books of reference. *H. J. O'D. Burke-Gaffney*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Šerstnev, E. O nekim karakteristikama epidemije rekurensa koji prenose uši u Bosni 1946–1949 g. [**Some Aspects of Louse-Borne Relapsing Fever Epidemic in Bosnia 1946–1949**] *Higijena*. Belgrade. 1953, v. 5, No. 2, 106–16, 3 maps. English summary.

An epidemic of louse-borne relapsing fever appeared in Bosnia in 1946; it attained a peak in 1947 with an incidence up to 5 per cent. and declined in 1948. Three main foci of infection could be distinguished, eastern, central and western; the incidences of relapsing fever and also of typhus are shown in maps. At the end of the war there was an epidemic of typhus in North and Central Bosnia, with an incidence of 30 per 10,000, and comparison of the incidence maps for 1946 showed that typhus and relapsing fever were not occurring in the same areas; in their subsequent behaviour the diseases appeared to be mutually exclusive, and as typhus died out in one area it was replaced by relapsing fever. The appearance of the latter disease in 3 separate foci is ascribed to the confinement of the initial cases to areas where the incidence of typhus happened to be low. Relapsing fever had not been reported from Bosnia before 1945, but it probably appeared in 1943–44 in unrecognized form. The possibility of introduction from countries to the north and south was considered improbable, and it is more likely that the disease had been endemic in Bosnia for some time and had remained undetected under wartime conditions. *D. J. Bauer*

Rageau, J. Clés pour l'identification des tiques du Cameroun. [**Keys for the Identification of Ticks of the Cameroons**] *Ann. Parasit. Humaine et Comparée*. 1953, v. 28, Nos. 5/6, 399–411. [17 refs.]

Rousselot, R. Notes de parasitologie tropicale. Tome I. Parasites du sang des animaux (système réticulo-endothélial) A.O.F. (1942–1945) Iran (1946–1947) A.E.F. (1948–1952). 152 pp., 44 figs. Tome II. Ixodes. [**Notes on Tropical Parasitology. Vol. I. Blood Parasites of Animals. Vol. II. Ticks**] 135 pp., 73 figs. 1953. Paris: Vigot Frères. [Fr. 2050.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, Nov., v. 41, Pt. 11, 169.]

These two volumes initiate a series on tropical parasitology. The first contains the results of the author's investigations on blood parasites of domestic and other animals and birds made in French West Africa in 1942–45 (pp. 7–123), in Persia in 1946–47 (pp. 125–140) and in French Equatorial Africa in 1948–52 (pp. 141–150). The parasites comprise protozoa and forms of uncertain position such as *Rickettsia*.

The introductory parts of the second volume include notes on the collection, preservation, study, rearing and control of ticks, the influence of climate on their life-history, and the general morphology of Ixodids and Argasids, and lists of the ticks of West Africa, the hosts of each, the species found on each host, the number of host changes during development in each species (if known) and the diseases, if any, that each species transmits. The distribution of the specimens collected is also shown. A systematic section comprises keys to families, groups, tribes, genera, subgenera and species. About half the work consists of an account of the morphology and hosts of each species, sometimes with notes on geographical distribution, duration of stages and pathogenic importance. The behaviour of a strain of *Ornithodoros moubata* (Murr.) and one of *O. savignyi* (Audouin), both in the French Congo, and experimental transmission by the former of *Spirochaeta anserina* in fowls are described.

Pavlovskiĭ, E. N. & Skruinnik, A. N. [**Some Biological Peculiarities of the Ticks** *Ornithodorus*—**Transmitters of the Tick-Borne Relapsing Fever**] *Dokl. Akad. Nauk SSSR.* Moscow. (n.s.) 1951, v. 78, No. 5, 1069–72. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, Nov., v. 41, Pt. 11, 185–6.]

The authors record the results of further observations in the Soviet Union on the length of life and resistance to starvation of *Ornithodoros tholozani* (Lab. & Mégn.) (*papillipes* (Bir.)), and on the persistence and transovarian transmission of the spirochaetes of relapsing fever in it.

When kept at 15–18°C. [59–64·4°F.] in flasks moistened with a drop of water once or twice a month and allowed to engorge once a year, 1,510 of 2,329 examples taken in Uzbekistan in 1944, 268 from 1,570 larvae that were reared in the laboratory and fed as larvae in 1939, and 38 males and 22 females of a batch of 3,069 ticks taken in the Pamirs in 1936 were all alive in 1951. One male taken as a nymph in 1934 in Turkmenia paired with a female in 1950, and the latter subsequently laid viable eggs. It is estimated that the total life of *O. tholozani* may reach 20–25 years.

A female has already been recorded as preserving relapsing-fever spirochaetes for 13 years. In a further test, a male and a female kept in the laboratory since 1937 both infected guineapigs at every subsequent meal, including those taken in 1951. In investigations on transovarian transmission, 41 batches of F_1 ticks reared from infected females and 14 batches of F_2 ticks were fed separately on guineapigs. Only two F_1 batches and one F_2 batch infected the guineapigs on which they fed as larvae, but 12 F_1 and six F_2 batches infected those on which they fed as first-stage nymphs. F_1 ticks that did not transmit the infection as larvae or first-stage nymphs did not transmit it subsequently, and those that transmitted it as nymphs usually continued to transmit for the rest of their lives. F_3 ticks did not transmit, but the ability of F_1 and F_2 ticks to infect man was shown in tests on patients suffering from progressive paralysis. The spirochaetes were preserved in this way from generation to generation for 14 years from the finding of the original infected individuals.

In tests on resistance to starvation, larvae survived without feeding for up to 15 months, though mortality became considerable after 6–7 months, nymphs in the first, second, third and fourth-fifth stages for 2, 4, 8 and 11 years, and adult males and females for 9 and 10 years respectively. Of 742 examples kept without food since 1940, eight nymphs and one female were still living in 1950, and one nymph, taken in the Pamirs in 1936

and allowed to feed in 1937 and again in March 1940 was still alive in 1951, 11 years later. Ticks that had not fed for ten years were emaciated and moved with difficulty, so that starvation for this period is probably close to the limit. Repeated starvation is also possible. Thus, two nymphs and a female that fed after eight years without food, survived without feeding again for another three years, and a male and a nymph that had fed after $7\frac{1}{2}$ years survived another $5\frac{1}{2}$ years. Females produced viable progeny after three and five years without food, and five nymphs that fed after ten years' starvation continued their development. Uninfected ticks acquired relapsing-fever spirochaetes when fed after being starved for 9–10 years and transmitted the spirochaetes at the following meals, and infected ones transmitted them after having been starved for seven years.

In tests with other ticks, *O. verrucosus* Olen., Zas. & Fen. survived without food for three years, *O. tartakovskyi* Olen. for four, *O. canestrinii* Bir. for six, and *O. lahorensis* Neum. for eight.

Davis, G. E. & Mazzotti, L. **The Nontransmission of the Relapsing Fever Spirochete, *Borrelia dugesii* (Mazzotti, 1949) by the Argasid Tick *Ornithodoros turicata* (Dugès, 1876).** *J. Parasitology.* 1953, Dec., v. 39, No. 6, 663–6.

Scaffidi, V. La forma polmonitica della febbre ricorrente cosmopolita. [**The Pneumonic Form of Cosmopolitan Relapsing Fever**] *Acta Med. Italica.* 1953, Sept., v. 8, No. 9, 225–36, 3 graphs. English summary.

Cosmopolitan or louse-borne relapsing fever is common in Mediterranean countries, other than France and Italy, and in West African territories. The author has read this paper at the Fourth International Congress of Mediterranean Medicine which was held during 21st–24th September 1953, in Barcelona: he claims to have been the first to describe this pneumonic form of relapsing fever, in 1936, when he worked in Italian East Africa. He deals with the signs and symptoms, clinical course, diagnosis, prognosis, pathology and morbid anatomy of the disease, the last being based on 3 cases which were studied by Palenzona. The paper includes a clinical account of 6 representative cases.

About 2 per cent. of cases of louse-borne relapsing fever are believed to show a primary lobar pneumonia which is due directly to the spirochaete, *Spirochaeta recurrentis*, and not to secondary infection. The chest symptoms in such cases are marked from the onset and often lead to an initial diagnosis of ordinary lobar pneumonia, more especially as the high fever generally subsides by crisis at the end of a week. The specific nature of such cases is often revealed by accident when blood examination is undertaken as a routine or for the occurrence of a relapse. But a relapsing fever infection may be suspected at an early stage because of enlargement and tenderness over liver and spleen, jaundice and early mental depression.

The author states that this pneumonic form of relapsing fever is characterized by sudden onset with chest pains, signs of lung congestion and consolidation, presence of blood in the sputum from the beginning, the dramatic result of treatment with arseno-benzol drugs and the liability to relapse with the signs and symptoms of relapsing fever. *J. Cauchi*

LEPROSY

Nuñez Andrade, R. La lepra en Colima, México. [**Leprosy in Colima, Mexico**] *Medicina.* Mexico. 1953, Nov. 10, v. 33, No. 687, 497–500.

The English summary appended to the paper is as follows:—

"The State of Colima, Mex., one of the smallest of the United States of Mexico, has an area of 5,205 sq. km. and a population of 120,653 inhabitants.

"Colima, Mex., was free from leprosy prior of the arrival of the Spaniards. It was imported, first by the said colonizers and second by travellers from the Philippines, Japan and China, coming to the Pacific Coast.

"The number of cases of leprosy in Colima, Mex., as officially recorded in the Office of Leprosy Control of the Secretary of Health and Welfare up to March 31, 1953, is 376. Of these, 105 are known to have died by that time.

"The Municipalities with the high prevalence rates per 1,000 inhabitants are: Colima, Minitatlán, Cuauhtémoc, Villa de Alvarez and Comala, with rates ranging from 5·92 to 2·13.

"Although no intensive survey has been made in many regions, it is believed that the number of cases in the State is over 2,000.

"The most frequent causes of deaths have been: leprous cachexia, enterocolitis, acute lobar pneumonia, cardiac insufficiency and pulmonary tuberculosis.

"For the campaign against leprosy only are following facilities: 1 special ward in the Civil Hospital and 1 dermatologic clinic, both in the City of Colima, Col., Capital of the State.

"The author suggests to establish 4 Special Rural Units of Leprology in the Municipalities of Minatitlán, Cuauhtémoc, Villa de Alvarez and Comala, for the best knowledge of leprosy in the State of Colima and also for the best treatment of patients with Hansen's Disease."

Montestruc, E. La communauté antigénique du bacille de Koch et du bacille de Hansen traduite par la réaction d'hémagglutination de Middlebrook, Dubos et la réaction d'hémolyse conditionnée. [**The Antigenic Affinity of** *Myco. tuberculosis* **and** *Myco. leprae* **deduced from the Haemagglutination Reaction of Middlebrook and Dubos, and the Conditioned Haemolysis Reaction**] *Rev. Coloniale de Méd. et Chir.* 1953, Oct. 15, v. 25, No. 217, 172–4. [11 refs.]

These reactions have been used by the same author as a basis of classification in leprosy [see this *Bulletin*, 1954, v. 51, 274]. He now uses them as evidence of the affinity of the tubercle (human and bovine) and leprosy bacilli, and particularly to support the practical advantages of the use of BCG in producing relative immunity to leprosy. Using tuberculin IP48 and also a fraction of the same as antigens, he obtained haemagglutination in 98·9, and conditioned haemolysis in 79·5 per cent. of lepromatous cases, and similarly in 61·6 and 46·2 per cent. of tuberculoid cases.

Ernest Muir

Dharmendra. **Chemotherapy of Leprosy.** *Indian Med. Gaz.* 1953, Jan., v. 88, No. 1, 35–50, 54. [54 refs.]

A very full review of the present position; most of the literature covered has been noted in this *Bulletin*.

Floch, H. & Sureau, P. La vitaminothérapie K dans la lèpre. [**Treatment with Vitamin K in Leprosy**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 631–7.

After mentioning the various vitamins that have been found beneficial in leprosy the authors describe the effects of treatment with vitamin K in 6 cases, the first 3 being tuberculoid and the last 3 lepromatous. Except in the first 2 there was amelioration of symptoms such as nerve pain, eye inflammation, etc. In some the improvement seemed to be more subjective than objective. But there was no effect on the general disease itself.

Ernest Muir

Merklen, F. P. & Riou, M. Résultats favorables d'un an d'essai de dérivés vitaminiques K dans la lèpre. [**Favourable Results in a Trial of Derivatives of Vitamin K in Leprosy**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 741–8.

Favourable results were obtained in 4 reacting cases of leprosy treated with a vitamin K derivative (2 methyl 1-4 naphthoquinone of menadione). There was not the sudden improvement obtained with ACTH, but it is considered that this latter substance should be confined to very special cases because its use is not without danger. Vitamin K can be given intramuscularly, intravenously or orally. It is particularly useful in reactions provoked by sulphones, and it is a useful adjuvant in sulphone treatment. It is said that with the preparation used, intravenous injection was preferred as intramuscular may—though very rarely—produce necrosis.

Ernest Muir

Barnay, A. L'appoint de l'électrologie dans le traitement de la lèpre. [**The Application of Electrotherapy in the Treatment of Leprosy**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 533–50.

An account is given of various forms of electrical treatment in leprosy and of the results obtained. The conditions in which amelioration resulted are: perforating ulcer, painful nerves, deformities of the hands and fingers, anaesthesia and paraesthesia, infiltrations.

The forms of electrical treatment most used are infra-red, ultra-violet, diathermy, and short waves applied either locally or to the whole length of the vertebral column. In healing perforating ulcers infra-red gave amelioration in 33 per cent. and cicatrization in 50 per cent.; diathermy gave 63 and 37 per cent.; short waves 50 and 33 per cent.; and ultra-violet 50 and 25 per cent. For irreducible deformities of the hand short waves applied to the spine gave amelioration in 40 per cent., but the following were also used: short waves locally, ionization with potassium iodide, diathermy and electric baths. The easiest apparatus to apply is the infra-red, and this can be used by the patient himself after a little training.

[The results described are certainly remarkable and the author's methods should be tried out elsewhere by those who have the facilities.]

Ernest Muir

Floch, H. & Sureau, P. La prégnénolone dans les réactions et les iridocyclites lépreuses. [**Pregnenolone in Reactions and in the Iridocyclitis of Leprosy**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 638–44. [10 refs.]

After reviewing the literature on the use of cortisone and ACTH in leprosy, the authors relate their experience with the steroid preparation

acetate of pregnenolone in the complications of leprosy in 2 cases. In the one case the nerve pains and febrile reaction were quickly and permanently brought under control. In the second the iridocyclitis was controlled, but eye complications had advanced too far to prevent glaucoma. This hormone may be given in all cases where cortisone or ACTH are indicated, but the authors prefer pregnenolone to the other 2 hormones. It is given in the form of 100 mgm. tablets, the daily dose being 5 tablets.

Ernest Muir

Silva, C. Vacinação B.C.G. na lepra. [**Vaccination with BCG in Leprosy**] *Hospital.* Rio de Janeiro. 1952, Dec., v. 42, No. 6, 931–42. [12 refs.]

The author describes 2 experiments which are envisaged. In the first, 4 municipal areas with a high endemicity of leprosy are chosen. All those who have been in contact with leprosy and who have negative lepromin reactions are given BCG by mouth to the total of 1,200 mgm., 6 doses of 200 mgm. each being given in a fortnight. No tuberculin control would be used in carrying out the experiment. In order to evaluate the power of BCG to produce resistance to leprosy the whole group would be divided at random into two divisions, to one of which would be given BCG and to the other some inert substance. The second experiment is of a more extensive nature in which all persons of an age less than 15 would be vaccinated indiscriminately with BCG and also those with a negative lepromin reaction from 15 to 29, those of more than 30 being left unvaccinated.

The objects of the experiments are two-fold: to observe the effect of BCG on the lepromin test results, and, after a period of over 5 years, to ascertain the prophylactic results, if any. *Ernest Muir*

HELMINTHIASIS

Bailenger, J. & Neuzil, E. Nouvelles techniques d'examen des helminthes: fixation; coloration; montage. [**New Methods for the Fixation, Staining and Mounting of Helminths**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, Nos. 5/6, 392–8, 8 figs. on 2 pls. [11 refs.]

Ghose, C. **Studies on Metabolism of Calcium, Inorganic Phosphorus and Cholesterol in Pregnancy with Helminthic Infection in Indian Women.** *Indian Med. Gaz.* 1953, Aug., v. 88, No. 8, 440–47, 3 figs. on 3 pls. [14 refs.]

"Subclinical helminthiasis in pregnancy does not significantly alter the concentrations of serum calcium, inorganic phosphorus and cholesterol. There is a distinct tendency for the total cholesterol concentration to fall on account of a significant lowering in the concentration of its ester fraction."

Harwood, P. D. **Parasitological Reviews. The Anthelmintic Properties of Phenothiazine.** *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 428–55. [206 refs.]

Amberson, J. M. & Schwarz, E. **On African Schistosomiasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 451–502, 4 graphs, 5 maps & 30 figs. on 8 pls. [Numerous refs.]

" (1) Two species of *Schistosoma* are known with certainty at this time to infect man in Africa, (a) *S. mansoni* with laterally-spined ova and (b) *S. haematobium* with terminally-spined ova. Whether *S. margrebowiei* is a human parasite, as has been claimed, requires further proof.

" (2) It is considered that both the human and animal parasites with terminally-spined ova in Africa should be considered subspecies of *S. haematobium*. We therefore distinguish (a) *S. h. haematobium*, (b) *S. h. capense* (provisionally), (c) *S. h. bovis*, and (d) *S. h. mattheei* group.

" (3) The *S. h. mattheei* group includes (a) *S. h. intercalatum* which is known as a human parasite and suspected to be a parasite of livestock; (b) *S. h. mattheei* which is known to be a parasite of livestock and suspected to be a human parasite; and (c) *S. h. curassoni* which is known from cattle, but is too imperfectly known for final appraisal both concerning its taxonomic status and host relationship.

" (4) As morphological differences of the adult flukes of the *haematobium* group are varying, overlapping and often doubtful, we consider as the best taxonomic method available at this time appraisal of the shape of the ova. The breadth-length ratio of the ova has been found to be most reliable. Variation graphs of a series of such ratios show characteristic subspecific values. The actual length of the ova is not absolutely characteristic as it varies with the host.

" (5) Although it is generally admitted that schistosomiasis may affect every part of the body of the vertebrate host, it is also true that preference of site may be characteristic of certain species, subspecies, possibly strains, and may show geographically circumscribed distribution, and variation according to host.

" (6) The clinical symptoms produced by *S. mansoni* are predominately intestinal.

" (7) The clinical symptoms produced in man by *S. h. haematobium* in North Africa, the Mediterranean area and Anterior Asia, and by *S. h. capense* in South Africa are predominately urinary.

" (8) In East Africa and part of West Africa urinary schistosomiasis in man is produced by some form of *S. haematobium*. It is not clear whether we have to deal with true *S. h. haematobium* in these areas.

" (9) In a great part of the Belgian Congo, the French Congo, and southern Nigeria intestinal schistosomiasis without vesicular symptoms is produced by *S. h. intercalatum*.

" (10) Schistosomiasis in primates produced by all forms of the *haematobium* group including *S. h. haematobium* is primarily of the intestinal type.

" (11) *S. h. haematobium* in North Africa, the Mediterranean area and Anterior Asia is primarily a human parasite. It has been shown to develop to maturity in monkeys, hedgehogs, the golden hamster, and possibly the fat-tailed gerbil. It does not develop to maturity, or at least does not produce viable ova, in the house-mouse, the laboratory strains of the Norway rat, the rabbit, and guineapig. It does not infect domestic livestock, like sheep, goats and cattle.

" (12) *S. h. bovis* in North Africa, the Mediterranean area and Anterior Asia does not infect man. It is primarily a parasite of livestock, cattle, sheep and goats. No data are available whether it will infect primates, but

it is known to develop in the European hedgehog, the house-mouse, the rabbit, the guineapig, the European hamster, and the cat.

" (13) As the taxonomic status of the *haematobium* group in West, Central, East and South Africa is uncertain, and as experimental evidence is insufficient, conclusions concerning the host relationship of these flukes are withheld.

" (14) *S. mansoni* is known in man and primates. In laboratory animals it is known to develop in the mouse, moderately in the guineapig, in the golden hamster, and in the rabbit. It does not occur in ungulates.

" (15) The snail intermediate host in Africa of *S. mansoni* is *Biomphalaria alexandrina* belonging to the family Planorbidae, subfamily Planorbinae. Two subspecies are admitted, (a) *B. a. alexandrina* and (b) *B. a. pfeifferi*.

" (16) The *S. haematobium* group is carried in Africa by snails of the genus *Bulinus*, family Planorbidae, subfamily Bulinae. Three species are known to be involved: (a) *Bulinus africanus*; (b) *B. truncatus*; (c) *B. forskalii* (only in Mauritius). In Portugal it is carried by *Planorbarius corneus metidjensis*, subfamily Planorbinae. Whether this species is a carrier in the Atlas countries where it occurs together with *B. truncatus*, is not definitely established.

" (17) The genera *Physopsis* Krauss based on *B. africanus* and *Pyrogophysa* Crosse based on *B. forskalii* are not considered valid, but are included in the synonymy of *Bulinus* O. F. Müller.

" (18) *B. truncatus* occurs in North Africa, the Mediterranean area, Anterior Asia, in the East African highlands and in South Africa as far as the Cape Peninsula. It is a species of moderately warm countries, but not adapted to the hot temperatures of the low-lying country in the Equatorial belt. *B. africanus* is a tropical species, and apparently does not survive below 15°C. (59°F.). Although in intermediate areas both species occur together, in the greater part of their range only one species exists. In the tropical area of Central Africa and the Guinea coast only *B. africanus* is found.

" (19) In the northern area as far as 11°N., both *S. h. haematobium* and *S. h. bovis* are carried by *B. truncatus* and will not infect *B. africanus*. Elsewhere all forms of the *S. haematobium* group are carried by *B. africanus*, and will not infect *B. truncatus*. The remarkable distribution of schistosomiasis in South Africa is identical with that of *B. africanus*, the infection being absent in the south-western part of the Cape Province where *B. truncatus* is found, but where *B. africanus* does not occur.

" (20) The part played in the transmission of *haematobium* schistosomiasis by *B. forskalii*, except in Mauritius, is incompletely known. No data exist concerning *B. senegalensis* which, on account of its scarcity, does not appear to be of real importance.

" (21) Measures to control schistosomiasis in Africa by means of snail control have not been successful. The currently known molluscicides have nowhere eliminated the infection. The development of therapeutic and prophylactic agents for the control of schistosomiasis in the vertebrate host should receive more intensive study."

[It will be seen from the summary just quoted that the authors consider that there is only one specific vector of *S. mansoni* in Africa:—*Biomphalaria alexandrina* which has two subspecies *B. a. alexandrina* and *B. a. pfeifferi*: while in the case of *S. haematobium* they believe that only one genus, *Bulinus*, is involved and that within this genus there are only 3 species which act as vectors:—*B. africanus*, *B. truncatus* and *B. forskali*. The authors' reasons for these assertions are given in considerable detail,

in so far as the conchological aspect is concerned, but they may be summarized by the following 2 quotations taken from the body of the paper. On page 452, when referring to the multiplicity of mollusc species quoted as vectors of schistosomiasis, they write:—"It is believed that the very great number of names that have been applied to the few species in question are only partly based on genetic differences, and are not of specific, not even of subspecific value. The great variation in the shell of these species is due to habitat modification produced by environment, or to individual variation within a single population. It appears, therefore, that the names given to these forms should be considered for what they are, namely, as synonyms. In a general way it can be said that the assemblage which we now unite under one specific name, represents one natural unit, fills one ecological niche, and is of the same biological value as a carrier of schistosomiasis". On page 463 the authors write:—"No pertinent anatomical differences can be found for the four species of African *Bulinus* (Hubendick, 1948) and the shell characters show a graded series from *B. africanus* to *B. forskalii*". The reviewer is not clear as to the precise meaning Dr. Amberson and Dr. Schwarz intend to be attached to this last quoted statement, but taken in conjunction with their previous comments it would suggest to the majority that these authors consider that even a further reduction might be possible and that the transmitters to man of both forms of schistosomiasis throughout Africa might be reduced to 3 or possibly 2 species of freshwater molluscs. (It is important to note that the authors make it evident that they consider that varieties within these few species may vary greatly, not only as regards their ecology and biological requirements, but also as regards their susceptibility to infection with different strains of schistosomes.)

The simplification suggested by Dr. Amberson and Dr. Schwarz would, if justifiable, be welcomed by every reasonable person who is concerned with the study of schistosomiasis in Africa, but before it is so accepted there must be a definite assurance that the new classification suggested by them is built on foundations sufficiently firm not to be easily upset by later workers. So far as the reviewer is capable of judging, Drs. Amberson and Schwarz's opinions are based mainly on conchological evidence and for a long time it has been clear that such evidence is only one aspect of a complex problem and that it is essential that this important but not conclusive evidence should be supplemented by the examination of the whole creature and not only of its shell. Whether, as has proved to be the case with many groups of arthropods transmitting disease to man, such evidence will require further support by an examination of the morphology of the various stages of development and their biological requirements, remains to be seen.] *R. M. Gordon*

Gaud, J. Notice épidémiologique sur les bilharzioses. [**Epidemiological Note on Schistosomiasis**] *Méd. Trop.* Marseilles. 1953, May–June, v. 13, No. 3, 320–27, 9 figs.

The author deplores the paucity of published work on schistosomiasis from the French Union and puts forward suggestions as to how the problem should be approached and errors avoided. Although it is simpler to consider the problem apart from other problems of health and hygiene, the prevention of schistosomiasis can in certain circumstances be carried out in conjunction with other preventive measures and in this way expenses can be kept down. Health services should collect information concerning (a) the social repercussions of schistosomiasis, and (b) the local modes of transmission with a

view to control measures. The first of these problems is discussed briefly with special reference to the necessity for finding out the true importance of the infection in a given locality and relating it correctly to morbidity and mortality. Under the second heading the approach to snail control is discussed and a number of recommendations are made, in particular with regard to systematic study of the biology of the snail vectors. A key to the genera of African molluscs which are potential vectors, is provided, and methods are described for the fixation and preservation of snails for the study of their anatomy and for the packing of living snails and eggs which are to be despatched. *J. J. C. Buckley*

Sabadini, L. & Marill, F. G. La bilharziose urinaire en Algérie. [**Urinary Schistosomiasis in Algeria**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 30/31, 521–4.

In 1925 the presence of small foci of vesical schistosomiasis infection was discovered in South Algeria [this *Bulletin*, 1926, v. 23, 474]. In 1939 vesical schistosomiasis suddenly made its appearance in two villages in West Algeria, where a canal system of irrigation had for some time been in operation. Investigations into the incidence of schistosomiasis in Algeria and the sources of the infection therefore were instituted. It was shown that Moroccan, Tunisian and, particularly, Senegalese troops in Tunisia during the early war years had vesical schistosomiasis, though they were often free from symptoms of the disease. These and others found to be infected were promptly treated in order to limit the risk of their disseminating the infection; but in spite of this during the last few years a new focus of the disease has appeared near the town of Algiers, and over a period of 18 months 120 new cases of infection came to light. The snail vector, as elsewhere in Algeria, is apparently *Bulinus contortus* which is present in the canals and reservoirs in large numbers. The immediate danger of wide diffusion of the infection throughout Algeria is now apparent, and the authors emphasize the urgent need for prompt and effective action by the appropriate authorities to forestall it. *A. R. D. Adams*

Le Gac, P., Lemaigre, C. & Tournier-Lasserve, C. Rôle du facteur humain dans l'épidémiologie de la bilharziose vésicale en Oubangui-Chari (A.E.F.). [**Rôle of the Human Factor in the Epidemiology of Urinary Schistosomiasis in Oubangui-Chari**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 685–8.

Schistosomiasis due to *S. mansoni* has always been a disease of importance in Oubangui-Chari, a province in French Equatorial Africa, but until very recently infections due to *S. haematobium* were rare. Thus in 1949, although 4,726 cases of intestinal schistosomiasis were reported, only 77 cases of the vesical form of the disease were noted. The authors state that cases of *S. haematobium* infection are now being imported into the area from the North by Africans of the Saras and Kabas tribes and that, in recent years, the introduction of apparently only a few cases of *S. haematobium* has led to a rapid rise of the infection rate in the indigenous population in at least two areas.

(a) *The forest region of Lobaye.* Prior to 1951 vesical schistosomiasis was rare in this area, but in January 1951 two recently introduced cases of *S. haematobium* infection were recognized in the area and during the next 12 months cases among the indigenous population mounted rapidly, as is

shown by the following figures of previously unrecorded infections:— in June, 14; in July, 24; in August, 12; in September, 57; in October, 71; in November, 76; and in December, 32; a total of 286 fresh cases during the year.

(b) *Basse-Koto.* This is a region where *S. mansoni* is common but where until 1951 not a single case of *S. haematobium* had been reported. In September of that year 2 cases were noted; both of the patients had only recently come into the area. The rapid rise of cases during the next 6 months is shown in the following table:—

	Adults		*Children*		
Date	*Males*	*Females*	*Males*	*Females*	*Total*
December 1951	5	4	7	4	20
February 1952	–	–	25	–	25
March	–	–	17	1	18
Total	5	4	49	5	63

It will be noted that the rise in the total infection rate is almost entirely due to an increase of infections among schoolboys, and the authors explain that these youngsters bathed several times a day in a pool which was also used by one of the introduced subjects with *S. haematobium* infection, a Hausa schoolboy, recently arrived from Lake Chad. *R. M. Gordon*

Lamy, L. La bilharziose dans la région de Brazzaville. [**Schistosomiasis in the Brazzaville Region**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 700–702.

Examination of faecal specimens (over 2,000) and urines of people in Brazzaville and within a radius of 100–120 km. revealed not a single autochthonous case of infection with *S. mansoni* or *S. haematobium*; the only cases found were people who were from other regions, Oubangui-Chari and Tchad in particular. The incidence of *S. mansoni* in these was 2·5 per cent. of 80 from Tchad and 19 per cent. of 74 from Oubangui-Chari. The incidence of *S. haematobium* was 50·7 per cent. of 126 from Tchad and 4·5 per cent. of 46 from Oubangui-Chari. This absence of autochthonous schistosomiasis in people of Brazzaville led to a search for a possible explanation and it was found that not only were there no schistosome vectors in the region but the only snails present were the terrestrial forms, *Achatina*. The absence of aquatic snails may be correlated with the low mineral content of the waters but it was observed that in general the aquatic fauna is very scanty and some other explanation must exist. Its discovery might provide some useful ideas in connexion with snail control.
J. J. C. Buckley

Garrigue, M. Extrait de compte rendu d'une enquête générale sur les bilharzioses à Bamako. [**Abbreviated Account of a Schistosomiasis Survey in Bamako, French West Africa**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 693–5.

This is an abbreviated account of the incidence, among various age groups, of *Schistosoma haematobium* and of *S. mansoni* infection in persons examined at Bamako [on the higher reaches of the Niger river in Upper Senegal towards the border of French Guinea]. *S. haematobium* infection is widespread in the area and appears in very young children; 74 per cent. of boys and 46 per cent. of girls are found to be infected at 10 to 11 years

of age; the disease caused is mild and apparently self-curing. *S. mansoni* infection is much less common, and was found in only 2 to 5 per cent. of those whose stools were examined for it; it causes much more significant symptoms and signs. Double infections with both parasites are not uncommon, and *S. mansoni* eggs were found in the urine of 2·5 per cent. of schoolchildren who also were passing *S. haematobium* eggs in the urine.

A. R. D. Adams

Ansari, N. & Faghih, M. Contribution à l'étude de la bilharziose en Iran. [**Study of Schistosomiasis in Iran**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 4, 515–26, 1 fig. & 4 maps.

Detailed information as to the distribution and incidence of schistosomiasis in Iran being lacking, the authors undertook in February 1952 to remedy this state of affairs and made a survey of 4 districts in Khouzistan. The topography of this region is described and its climate, irrigation systems and agriculture are mentioned briefly. The enquiry was limited to a search for eggs of *Schistosoma*, particularly in schoolchildren, and for snail vectors.

District No. 1. Ahvaz and its neighbourhood: 93 children were examined and 2 (2·17 per cent.) were positive. No living snails were found and though shells of *Lymnaea*, *Melania* and *Melanopsis* occurred, there were no shells of *Bulinus*.

District No. 2. Hamadieh region: Urines of 29 children were examined and eggs were found in 4 of these. No living snails were found but 2 shells of *Bulinus contortus* and shells of *Melania tuberculata*, *Melanopsis*, *Lymnaea* and *Planorbis mareoticus* occurred.

District No. 3. Mian Ab: 111 persons from 7 different localities were examined and 53 (47·8 per cent.) were infected. *B. contortus* was plentiful but no live snails were found.

District No. 4. Abadan-Khorramshahr: Urines of 150 schoolchildren were examined and no eggs were found. Dead shells of *B. contortus* were found in certain secondary canals, also those of *Melanopsis* and *Melania tuberculata*. The only living snails present were *Lymnaea*.

The significance of these findings is discussed in relation to agricultural development and the economic progress of the country. *J. J. C. Buckley*

de Azevedo, J. F. Les bilharzioses humaines au Sud du Save (Mozambique). [**Human Schistosomiasis in Sul do Save, Mozambique**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 820–32, 14 figs. (2 on 2 pls.).

The numbers and proportions of Africans, Europeans and persons of mixed descent who were found infected in different age groups in the area are shown in tables and graphs. Attempts to estimate the intensity of infection by counting the number of eggs passed in the urine and faeces are bound to give unsatisfactory results, since the passage of the eggs is irregular and since many of them do not appear in the excretions but are retained in the tissues. The authors, therefore, tried to estimate the intensity of the infection by comparing together the haemoglobin index, the total red cell count and the protein fractions in the serum of Africans known to be suffering from *S. haematobium* infections with the figures obtained from Africans apparently free from schistosome infection. The results of these observations, in so far as estimating the intensity of infection was concerned, were inconclusive, but the authors consider that the results clearly prove that both *S. mansoni* and *S. haematobium* infections have an effect on the protein composition of the patients' sera.

The only molluscs found in the area which are likely to be vectors of schistosomiasis are *Physopsis africana*, *Biomphalaria pfeifferi*, and *Bulinus (Pyrgophysa) forskali*. The two first-named species have been found naturally infected with cercariae corresponding to the human type. In the laboratory the authors infected *P. africana* with *S. haematobium*, and *B. pfeifferi* with *S. mansoni*, but in spite of many attempts they failed to infect *P. africana* with *S. mansoni* or *B. pfeifferi* with *S. haematobium*. *B. forskali* is sparingly distributed in the area and since it was never found naturally infected the authors consider it is unlikely to play a part in disseminating infection.

In the absence of a satisfactory molluscicide, the wide distribution of the snail vectors over a vast and sparsely inhabited area renders generalized control impossible. On the other hand propaganda directed to explaining the value of personal prophylaxis when using drinking, washing or bathing water, is giving good results, and this is especially noticeable when the propaganda is conducted among schoolchildren.

This paper provides an interesting and practical account of the problems presented by vesical and intestinal schistosomiasis in southern Mozambique.

R. M. Gordon

Deschiens, R., Lamy, L. & Mauzé, J. Répartition géographique et fréquence de la bilharziose intestinale en Guadeloupe. [**Geographical Distribution and Incidence of** *S. mansoni* **Infection in Guadeloupe**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 810–19, 8 figs. on 2 pls. & 1 folding map.

The authors' summary in French is freely translated as follows:

The infestation rate (malacological index) of *Australorbis glabratus* seems to be the most reliable method of locating foci of intestinal schistosomiasis in Guadeloupe. The chief foci observed are as follows: Point-à-Pitre (malacological index: 30 to 90 per cent.), Basse Terre (12 to 56 per cent.), Baie-Mahault (40 per cent.), les Abymes (80 per cent.) and Sainte-Anne (4 to 5 per cent.).

The dependent islands of Guadeloupe, although some of them are populated with *A. glabratus*, have not been found to be infected.

The mean incidence of infection in people of Guadeloupe is 7·8 per cent. The ratio of schistosomiasis to general morbidity is 28 per 1000.

A. glabratus is widespread in Guadeloupe and its geographical distribution has been mapped.

Marshy regions, irrigation canals, pools, puddles, filtration water, dead or artificial inlets of rivers, open drains, ponds and bathing pools are the usual snail habitats.

In the light of these data, the eradication of intestinal schistosomiasis in Guadeloupe by snail destruction (drainage, sanitation and molluscicides) seems to be quite feasible.

J. J. C. Buckley

Dias, E. Estudos preliminares sôbre a esquistossomose mansoni no Município de Bambuí, Estado de Minas Gerais. [**Preliminary Studies on** *S. mansoni* **Infection in Bambui County, Minas Gerais, Brazil**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, July, v. 5, No. 3, 211–15, 1 map.

The English summary appended to the paper is as follows:—

" In 1,600 stool sedimentation tests performed by the field station of the Instituto Oswaldo Cruz in Bambuí county, under the direction of the

author, 88·4 per cent. were positive for helminths, 9·44 per cent. for *Schistosoma mansoni*, 65·25 per cent. for *Ancylostomidae*, 39·25 per cent. for *Ascaris lumbricoides*, 8·19 per cent. for *Trichuris trichiura* and 5·06 per cent. for *Taenia* sp. Forty foci of *Planorbidae* were found, out of which 15 or 37·50 per cent. were positive for furcocercariae. Out of 6,349 specimens of *A. glabratus*, there were 4·61 per cent. of furcocercariae.

"In a post-mortem examination of a case of intestinal schistosomiasis associated with American trypanosomiasis, granulomas with eggs of *S. mansoni* were found in the lungs as well as myocarditis caused by *Schizotrypanum cruzi*."

Deane, L. M., Martins, Regina S. & Lobo, M. B. Um foco ativo de esquistossomose mansônica em Jacarepaguá, Distrito Federal. [**Active Focus of** *S. mansoni* **Infection in Jacarepaguá, Rio de Janeiro**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, July, v. 5, No. 3, 249–52.

The English summary appended to the paper is as follows:—

"The authors have found an active focus of schistosomiasis (*Schistosoma mansoni*) in Jacarepaguá, a district of the city of Rio de Janeiro, Brazil. Both snails and humans were found infected.

"Planorbid snails (*Australorbis* sp.) were present in 121 out of 251 water collections examined in the area and *S. mansoni*—infected snails were found in 3 irrigation ditches. Of 2,905 snails examined, 10 (0·3%) harbored cercariae of *S. mansoni*.

"Feces of 119 school children and 10 farmers living in the area were examined by Hoffman, Pons & Janer's method. Two of the children and 5 of the farmers were passing *S. mansoni* eggs.

"Both children referred above were born in Jacarepaguá—but have lived elsewhere, but 4 of the farmers were immigrants from Portugal (where *S. mansoni* does not occur). After their arrival in Brazil, they have never been out of Rio de Janeiro, and 2 of them have never lived outside Jacarepaguá."

Senterfit, L. B. **Immobilization of** *Schistosoma mansoni* **Miracidia by Immune Serum.** *Proc. Soc. Exper. Biol. & Med.* 1953, Oct., v. 84, No. 1, 5–7, 2 figs.

The author refers to literature on the immobilization of ciliates and free-living flagellates by antibodies. For his own work he used miracidia obtained from the livers of infected hamsters, the livers being macerated in 0·15 M NaCl. The miracidia were collected from the sediment of this suspension. Immune sera were obtained from golden hamsters infected with *Schistosoma mansoni* and from monkeys infected with *S. mansoni* and *S. japonicum*. The controls included normal sera of hamsters, monkeys and man. All sera were heated at 56°C. for half an hour. Five drops of the serial dilutions of the sera used (1 in 10, 1 in 20, 1 in 40, 1 in 80, 1 in 160) were added to 5 drops of the suspension of miracidia and the mixture was allowed to stand for 10 minutes at room temperature. The effects were observed microscopically.

The results, given in a table, show that miracidia were immobilized by dilutions of 1 in 10 and 1 in 20 of the immune sera, but that, in dilutions higher than these, some of their cilia remained active, the immobilization being then confined usually to specific areas of the miracidium. Bleeding,

at intervals of about 10 days, of a rhesus monkey infected with 500 to 600 cercariae of *S. mansoni* showed that the immobilizing activity of the sera from this monkey first appeared between the 39th and 48th day and that its titre increased to a maximum of 1 in 160 on about the 75th day. The author suggests that the appearance of the immobilizing factor in the sera may be stimulated by egg-laying by the schistosomes.

Titres of cercarial precipitation and agglutination reactions are also given for comparison, the latter being quoted from the unpublished data of Liu and Bang. Sera from 2 monkeys infected 5½ years previously with *S. japonicum* gave a positive reaction at a dilution of 1 in 10, a result which suggests possible use of this reaction for the diagnosis of chronic infections of man. All tests done with normal sera of the monkey, hamster and man were negative, but one series from a human case of trichiniasis gave a positive result at a dilution of 1 in 20. *G. Lapage*

Buttner, Alice. Sur l'aptitude de certains rongeurs sauvages à devenir réservoirs de virus de la bilharziose intestinale humaine. [**The Capability of Certain Wild Rodents to Become Reservoirs of Human** *S. mansoni*] (Note préliminaire) *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 696–700.

Since Schwetz [this *Bulletin*, 1953, v. 50, 429] recorded the presence of lateral-spine schistosome eggs in 2 species of wild rodents captured in the region of Albertville in the Belgian Congo, the question arises whether the parent worms are the same species as infect man under the name of *S. mansoni* and if so, are the slight differences noted in the morphology of the eggs due to their being derived from a variety of *S. mansoni* which has become adapted to the rodent host? The author of the present paper records the results she has obtained from exposing some 12 species of wild rodents to the cercariae of the following 3 strains of *S. mansoni*: (a) An Egyptian strain from near Cairo, (b) a strain from French Guinea, and (c) a South American strain. The species of rodents used and their origins were as follows: *Glis glis*, Europe; *Eliomys quercinus*, Europe and North Africa; *Apodemus sylvaticus*, Europe and Asia; *Rattus norvegicus*, world wide; *Evotomys* [*Clethrionomys*] *glareolus*, Europe; *Oryctolagus cuniculus*, *Meriones libycus*, Africa; *Citellus citellus*, Central Europe and Africa; *Cricetus auratus*, Asia. In addition, domestic guineapigs were exposed. These animals were exposed to infection by immersing them in water containing cercariae, the number of cercariae to which the animal was exposed being adjusted in accordance with the weight of the animal. In this way the animals were exposed to massive, moderate or light infections.

The results showed that all the species of wild rodents exposed subsequently became infected and for the most part they were highly susceptible to all 3 strains. Although all species were susceptible to infection, in the sense that they allowed development of the cercariae to the adult schistosome form and that these adults produced fertile eggs, these eggs did not find their way into the faeces in every instance. On the other hand, even in those instances where the eggs did not reach the lumen of the bowel they nevertheless remained alive in the tissues and the author believes that in such instances, on occasions, the miracidia may escape from the eggs and infect snails as a result of the rodent's destruction, at the waterside, by some carnivorous beast. *R. M. Gordon*

Price, D. L. **A Board designed for exposing Larger Animals to Schistosomes in the Laboratory.** [Research Notes.] *J. Parasitology.* 1953, Dec., v. 39, No. 6, 675–6, 1 fig.

DE AMORIM, J. P. Infestação experimental e natural de murídeos pelo *Schistosoma mansoni*. Nota prévia. [**Infection, Experimental and Natural, of Muridae (in Alagoas) by** *Schistosoma mansoni*] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, July, v. 5, No. 3, 219–22. English summary (7 lines).

When undertaking an investigation into the susceptibility of certain rodents to infection by *S. mansoni*, the author discovered, at a preliminary examination, that some of the animals were already infected in nature. These were *Nectomys squamipes, Oxymycterus angularis* and *Holochilus sciureus*. Others examined were *Rattus rattus frugivorus, Cercomys cunicularis inermis, Zygodontomys pixuna* and *Oryzomys subflavus*. They were placed for 30 minutes in contact with water containing crushed infected snails [*? Australorbis*]. The first two of these became infected, the third escaped, the fourth died 21 days after exposure and another (previously uninfected) *Oxymycterus angularis* died 4 days after exposure to the infected water and signs of infection were not detected in these. It was noticed that the parts of Alagoas where the naturally infected rodents occurred were also the site of highest human infection: in the wooded region 56·41 per cent., reported by PELLON and TEIXEIRA (*Distribuição Seagráfica de Esquestossomose mansônica no Brasil*—Divisão de Organização Sanitána, 1 vol., 1950); 24·62 per cent. in inland zones, and 15·75 per cent. on the littoral. *H. Harold Scott*

DE LUCENA, D. T. Chave provisória para diagnose das espécies brasileiras de moluscos planorbídeos. [**Tentative Key to the Brazilian Planorbidae**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, July, v. 5, No. 3, 245–8. English summary.

This key should prove of much service to all those engaged in the study of schistosomiasis in Brazil. The family includes 4 genera: *Drepanotrema, Gyraulus, Australorbis* and *Tropicorbis*. Those important as vectors of *Schistosoma mansoni* are the 2 last and the key shows the points of differentiation between *Australorbis glabratus olivaceus, A. camerunensis* [*Biomphalaria alexandrina pfeifferi*], *A. immunis, A. tenagophilus* and *A. bahiensis* of the former genus, and *Tropicorbis stramineus* (*centimetralis*) and *T. janeirensis* of the latter. The main distribution of each is mentioned. *H. Harold Scott*

PARAENSE, W. L. & SANTOS, J. M. Um ano de observações sôbre esquistossomose em planorbídeos da Lagoa Santa. [**Schistosome Infection of** *Planorbidae* **in Lake Santa**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, July, v. 5, No. 3, 253–69, 1 map, 1 fig. & 2 graphs. [11 refs.] English summary.

This is a report on an investigation carried out during a period of 13 months from April 1952. Lagos Santa is in the State of Minas Gerais, a district where *S. mansoni* infection is endemic. Among 290 schoolchildren examined 40 (13·8 per cent.) were found infected and in the whole State the index was 4·9. The snails, *Australorbis olivaceus*, were collected twice monthly and altogether 2,306 specimens were obtained and nearly 10 per cent. were found infected. A table shows the numbers collected month by month and the percentages infected. The numbers collected rose rapidly to 328 in September, from 154 in August, reached a peak (562) in October, fell to 348 in November and then rapidly decreased, the rise being due probably to the dry season and the subsequent fall to the heavy rains starting in

November. The measurements of the infected snails are given, those below 4 mm. being discarded as they were practically never found infected. Winds, strong at times, set up waves which carry the cercariae to places some distance from their primary sites. Thus cases have been reported among persons swimming round a vessel anchored 550 metres from the nearest shore, and BANG is quoted by the authors as saying that "Many soldiers were infected in a river at least a mile from any constant source of snails". [See also TRAVASSOS, this *Bulletin*, 1954, v. 51, 191].

H. Harold Scott

RODRIGUES DA SILVA, J. O diagnóstico de actividade das esquistosomoses por meio da biópsia rectal. [**The Diagnosis of Activity of Schistosomiasis by means of the Rectal Biopsy**] Reprinted from *Rev. Brasileira Gastroenterologia*. 1952, Jan.–Feb., v. 4, No. 1, 263–82, 13 figs. [39 refs.] English summary.

The activity or inactivity of intestinal schistosomiasis may be assessed by the condition of the eggs found at rectal biopsy. There are 4 stages of degeneration of the eggs

A—viable eggs which may be (a) immature, (b) mature.

B—Dead eggs which may be (a) recently dead, (b) calcified, (c) remnants—empty or filled with host's cells.

C—Defectively developed eggs.

D—Eggs encapsulated in parasitic nodules.

The appearance of the eggs obtained at rectal biopsy before and after treatment is of great value in assessing the effectiveness of the treatment. The finding of immature defectively developed eggs, shells and parasitic nodules may confirm the diagnosis in patients who have been out of an endemic area for many years. In the abence of viable eggs in the stools, the activity of the disease can only be certainly established by the finding of them in rectal biopsy material.

[The illustrations are useful and well reproduced.] *C. J. Hackett*

EL-RAMLY, Z. & ABDIN, F. **A Clinico-Pathological Report of a Case of Advanced Bilharzial Cor Pulmonale.** *J. Egyptian Med. Ass.* 1953, v. 36, No. 10, 638–43, 5 figs. on 3 pls.

"1. The clinical picture of a case of advanced bilharzial cor pulmonale with right-sided heart failure is given.

"2. The clinical diagnosis of the case was supported by the radiological, electrocardiographic and haemodynamic studies.

"3. The autopsy report and histological findings in the case are included. The bilharzial tubercles in the lung were few and calcified denoting the chronicity of the lesions. The main changes were diffuse arterial and obliterative arteriolar lesions with hypertrophy of the right heart and dilatation of the pulmonary artery and its branches."

LIPPARONI, E. Sul "Nilodin" nella terapia della schistosomiasi vescicale in Somalia. [**Nilodin in the Treatment of Visceral Schistosomiasis in Somaliland**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Oct., v. 34, No. 10, 530–37. English summary.

The author has treated 40 patients in hospital: 39 were Africans and one Italian. He divided the cases into 4 groups and the total dosage given

varied from 60 to 125 mgm. per kgm. of body weight. The courses were spread over 3 days in half the cases and 6 days in the others.

Nilodin—Miracil A (German) or Miracil D (British)—is a synthetic compound of a greenish-yellow colour and with a fairly bitter taste. It is put up in tablets of 200 mgm. each, scored for convenience of division.

A cure in 95 per cent. of cases treated with Nilodin has been claimed in Tanganyika; Lipparoni in Somaliland obtained a dramatic cure in 13, or 32·5 per cent., of his 40 cases. Nine others (22·5 per cent.) improved. Some of the patients showed signs of intolerance to the drug, *i.e.*, nausea, gastric pain and general malaise; because of this, 2 patients ran away just before finishing the course of treatment.

Lipparoni suggests the possibility that the Somaliland varieties of *Schistosoma haematobium* may be particularly resistant to the drug, which he does not consider suitable for mass treatment in that territory also because of its toxicity and its cost. *J. Cauchi*

Rodrigues da Silva, J. O Miracil D no tratamento da esquistossomose mansónica. [**Miracil D in the Treatment of** *S. mansoni* **Infections**] Reprinted from *Rev. Brasileira Med.* Rio de Janeiro. 1952, Aug., v. 9, No. 8, 577–81. [18 refs.]

This paper reports results following the use of Miracil D or Lucanthone in Brazil. Lucanthone hydrochloride or salicylate were used in dosages of 75 mgm. per kgm. body weight in 8 approximately equal doses given by mouth morning and night for 4 consecutive days. Patients remained in bed during treatment.

Nausea, vomiting, insomnia and vertigo were frequent but were less severe after the salicylate than after the hydrochloride. Signs of intolerance appeared from the second day of treatment and lasted for 2–3 days after suspension of the drug. In 8 of 30 patients receiving hydrochloride and 4 of 24 receiving salicylate the course of treatment could not be completed, owing to the severity of the reactions. Coloured patients showed better tolerance than white patients.

The criteria of cure were severe, the search for and examination of ova in rectal biopsy material starting 4 months after treatment. Four months' delay was chosen for it was believed that any recovery of suppressed ovulation following treatment would have occurred by then. Even with this the author is not completely satisfied since he recalls that Ottolina has demonstrated at post mortem that living worms in a phase of interrupted ovulation may be present when only dead eggs are found in the intestine.

Of 22 patients treated with Lucanthone hydrochloride no viable eggs were found in 10 and in the other 12 viable eggs were found. Two to four faecal examinations within the 4-month period revealed no eggs at all. The number of eggs in biopsy material was greatly reduced in all cases and, except in 2, in which eggs containing miracidia were found, the only viable eggs found showed some degeneration which might well have prevented them from maturing.

All these patients showed considerable improvement and all increased in weight. An increased number of eosinophiles followed treatment; this was attributed to the action of the drug itself on eosinophile formation as is the eosinophilia following treatment with antimony since it occurs after the latter drug in patients without schistosomiasis.

The author says that his results are not as good as those reported by other workers who used the drug in urinary schistosomiasis, but points to

the severity of his assessment of cure by rectal biopsy delayed until 4 months after treatment. Miracil D has the advantage of being given by mouth and also of having a smaller risk of fatal accidents such as have occurred with antimonials.

Lack of uniformity in criteria of cure largely prevents direct comparison of the curative value of Miracil D and antimonials. However, Dias, Borrotchin and da Silva [see below], using almost identical criteria of cure, obtained 63 per cent. of apparent cures in 127 patients after antimony sodium tartrate in doses of 12 mgm. per kgm. body weight in 2 days and 49 per cent. in 82 patients with 7·5 to 8 mgm. per kgm. With the same criteria of cure, da Silva and Dias (1951, 3a *Jornada Brasiliera da Gastroenterologia, S. Paulo*), using " gluconate of trivalent antimony and sodium " in doses of 15 mgm. per kgm. in 2 days (12 patients) and 20 mgm. per kgm. in 6 days (14 cases) obtained 50 per cent. and 71·5 per cent. of apparent cures. The author has used this preparation together with Miracil D. He regards Miracil D as a substance of promise and hopes for more effective derivatives of the series which will be of great use in mass treatment of intestinal schistosomiasis. *C. J. Hackett*

Dias, C. B., Borrotchin, M. & Rodrigues da Silva, J. Tratamento rápido da esquistossomose mansónica pelo tartarato de antimónio e sódio. [**Rapid Treatment of** *S. mansoni* **Infections with Antimony Sodium Tartrate**] Reprinted from *Rev. Brasileira Med.* Rio de Janeiro. 1952, Oct., v. 9, No. 10, 723–6. [18 refs.]

The following is a translation of the authors' summary :—

The authors conclude that the results obtained from the rapid treatment of 543 schistosomiasis mansoni patients with antimony sodium tartrate are favourable. No serious incident occurred in the whole group of patients, although tolerance was better with the one-day scheme. The results of treatment could not be controlled in 310 patients treated at Aimorés, owing to the difficulty of carrying out the control tests. The cure rate or " negativization " rate was 48·7 per cent in 82 patients given the one-day treatment, with a dosage of 7·5 to 8 mgm. per kgm., and 61·5 per cent. in 122 cases treated with the two-day scheme, with 12 mgm. In 20 cases, treated by the one-day method, in Rio de Janeiro, 70 per cent. of " negativization " was established, these more satisfactory results being attributed to the fact that the patients presented infections of a lesser degree, having been longer away from the endemic areas. [Criteria of cure were based on the presence and condition of eggs in rectal biopsy 4 months after treatment.] The association of vitamin K with the antimonial gave no better results, either in respect of tolerance or in therapeutic efficiency. *C. J. Hackett*

Lagrange, E. La lutte biologique contre les Planorbes. [**Study of Biological Control of Planorbids**] *Ann. Soc. Belge de Méd. Trop.* 1953, June 30, v. 33, No. 3, 227–36.

Experiments were carried out with various kinds of fish in aquaria to assess their possible value in the biological control of Planorbid snails, with the following results:

(1) *Umbra pygmaea* is a non-African species from the United States and has become acclimatized in Holland. In aquaria it was observed to feed voraciously on young Planorbid snails of 2–3 mm. in diameter but snails of 1 cm. and over were left untouched. Two of these fish were placed in an

aquarium with a thriving colony of snails, and after 2 months no small snails were present, though large ones still remained and oviposition was still taking place. This fish was very tolerant of temperature variations and food scarcity but did not reproduce in captivity.

(2) *Cichlasoma biocellatum*, also a non-African species from South America is well known for its voracity and pugnacity. Like the previous species it prefers to eat the young snails but was seen to attack large snails and partly devour them.

Both *Umbra* and *Cichlasoma* are believed to be potentially good agents in snail control but their introduction into Africa involves the usual risks of upsetting the local ecology.

(3) *Tetraodon schoutedeni* occurs in Stanley Pool but is unknown elsewhere in the Congo. Like *Cichlasoma*, it can attack and devour large Planorbids, leaving the shell intact. Between the 20th October and 14th November one specimen devoured 240 large snails in an aquarium. Although its distribution is limited, owing to factors yet unknown, it is possible that it might be successfully introduced into other localities.

(4) *Pelmatochromis kribensis* from the Cameroons is a carnivorous species which devoured small snails but snails of 3 mm. diameter and over were safe from its attacks.

Observations on 2 species of *Tilapia* did not give encouraging results. *Nannochromis nudiceps* proved to be only an occasional snail-eater, comparing unfavourably with the voracity of *Pelmatochromis*. Two specimens of *Tetraodon fluviatilis*, from Malaya, lived only for 2 and 5 days.

J. J. C. Buckley

Mansour, T. E. & Bueding, E. **Kinetics of Lactic Dehydrogenases of *Schistosoma mansoni* and of Rabbit Muscle.** *Brit. J. Pharmacol. & Chemotherapy.* 1953, Dec., v. 8, No. 4, 431–4, 3 figs. [10 refs.]

It has been shown by the author [this *Bulletin*, 1951, v. 48, 653, 654] that glycolysis proceeds rapidly in *S. mansoni* and appears to be very important for survival of the parasite. In the present investigation an attempt has been made to find whether there are any differences in the gylcolytic enzymes of parasite and host. The kinetics of lactic dehydrogenases from *S. mansoni* and from rabbit muscle were therefore compared. Adult worms were obtained from infected mice and minced with scissors in water at a temperature of 0° to 2°C. The extract was centrifuged and the supernatant used or the enzyme was absorbed on calcium phosphate gel and then eluted in buffer. Preservation of the enzyme in the frozen state was effected in 32 per cent. sucrose. The enzyme from rabbit muscle was prepared by standard techniques. Activity of the enzymes was based on the change in optical density of diphosphopyridine nucleotide (DPN) resulting from oxidation or reduction. In the reduced form a peak appears at 340 mμ during the following reaction:

$$\text{Lactate} + \text{oxidized DPN} \rightleftarrows \text{pyruvate} + \text{reduced DPN}$$

The change observed in the spectrophotometer provides a delicate means of following the reaction.

In the above reaction the schistosome enzyme was active at a lower *p*H than that from rabbit muscle in either direction. Taken in conjunction with the fact that optimal substrate concentrations and dissociation constants for the schistosome enzymes are higher it appears that the two enzymes are not identical although they bring about the same reaction.

J. D. Fulton

KUNTZ, R. E. **Demonstration of the " Spreading Factor " in the Cercariae of** *Schistosoma mansoni*. *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 397–402, 1 fig. [12 refs.]

The capacity of suspensions of macerated cercariae of *S. mansoni* to spread when injected intradermally in the rabbit suggests that this trematode may secrete something resembling hyaluronidase. The power of these suspensions to spread was demonstrated with the help of Evans blue dye as indicator, the cercariae being first crushed in a mortar and suspended in a small amount of water to which the dye was added prior to injection into the skin of shaved rabbits. As controls, macerated snail faeces with which the cercarial preparations were contaminated, mixed with dye, and also saline with dye, were used. The amount of spread of the dye was traced on tissue paper at definite intervals. The capacity to cause spreading was shown by fresh suspensions of cercariae as well as by those stored in the refrigerator. An area 30 to 50 times as great as the original bleb was seen at the time of maximal spread which occurred after 18 to 24 hours. The amount of spread was not always proportional to the number of cercariae injected. Proof that the spreading effect was brought about by hyaluronidase was not forthcoming. *J. D. Fulton*

EVANS, A. S. **Quantitative Demonstration of Hyaluronidase Activity in Cercariae of** *Schistosoma mansoni* **by the Streptococcal Decapsulation Test.** *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 417–27, 5 figs. [10 refs.]

A method in which the streptococcal decapsulation test is used for assay of the enzyme concerned in cercariae of *S. mansoni* is described. MCCLEAN [*Bulletin of Hygiene*, 1942, v. 17, 202] was the first to make use of this test when investigating the spreading factor (hyaluronidase) and it has been used recently by STIREWALT and EVANS [this *Bulletin*, 1953, v. 50, 223] to demonstrate the presence of an enzyme with similar activity, from the same source as that described by the present author.

The parasites were obtained from snails and freed as far as possible from faecal and other contaminants, and finally dried *in vacuo* at refrigerator temperatures. On grinding they were extracted with buffer for 4 hours at 8°C. and *p*H 6·6. Group C haemolytic streptococci freshly separated from culture medium were used as substrate, and the resuspensions in buffer were standardized at a certain optical density. The substrate suspension was mixed with twice its volume of cercarical extract at 26°C. Heating at 56°C. was used to terminate the reaction. Hyaluronidase from bull testes was used in a similar reaction for comparative purposes. Indian ink helped to demonstrate loss of capsular material. The method of calculating results was rather involved and should be consulted in the original.

The activity of the enzyme obtained from cercariae measured by reduction in volume of the capsules of Group C streptococci was proportional to the number of organisms present. Evidence for the " hyaluronidase " nature of the enzyme was presumptive. *J. D. Fulton*

BERG, E. **Effect of Castration in Male Mice on** *Schistosoma mansoni*. *Proc. Soc. Exper. Biol. & Med.* 1953, May, v. 83, No. 1, 83–5. [24 refs.]

" A group of castrated male albino mice and an uncastrated control group were equally infected with *Schistosoma mansoni*. Nine weeks later

the animals were sacrificed and the adult parasites collected, separated according to sex and counted. The mean adult parasite count per mouse, for each group, showed a significant reduction in the male schistosomes of the castrated animals. This difference indicates a relationship between male sex hormones and the male parasite."

Vogel, H. & Minning, W. Über die erworbene Resistenz von *Macacus rhesus* gegenüber *Schistosoma japonicum*. [**The Acquired Resistance of** *Macacus rhesus* **to** *Schistosoma japonicum*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Oct., v. 4, No. 4, 418–505, 25 figs. [Numerous refs.]

This is a detailed account of important investigations which have been carried out at the Hamburg Tropical Institute from 1939 to 1954. It is impossible to do justice to it in an abstract and the original paper should be consulted by all who are interested in schistosomiasis. The following is a free translation of the German summary:—

Stimulated by epidemiological observations in a schistosomiasis district of China, the authors investigated whether rhesus monkeys acquire resistance to repeated infections with *S. japonicum*. The monkeys were exposed to infections with known numbers of cercariae either of both sexes, or of males only. During the whole course of the infection, which in one case lasted 10 years, the excretion of eggs was measured. Simultaneously observations were made on the body weight, temperature, blood count, and complement fixation; finally post-mortem examinations were made to determine the number and site of worms and pathological changes.

The smallest number of cercariae which proved lethal as a first infection was about 400–800, both sexes being present; first infections of 200–400 could be tolerated. The tolerance for infections of unisexual male infections was considerably higher.

In rhesus monkeys, the chief site for deposition of eggs and damage to organs is the intestine and not the liver, and the cause of death (when it occurred) was severe damage to the intestine. Infections which run a severe course always produce a high egg count, and monkeys which excrete more than 2,700 eggs per ccm. of faeces have a bad prognosis. The first eggs were observed in the faeces 34–42 days after first infections. After a single first infection with both male and female cercariae the egg count at first rose and then gradually declined (Period I); then there was a Period II in which eggs were always present but often too few to count; and then Period III in which scanty eggs and miracidia occurred only occasionally. After superinfection (which encountered some resistance) the excretion of eggs differed from the above in that Period I was shorter, and the total number of eggs was smaller, Period I or Period II might be absent, and Period III began earlier. During a series of infections given to 3 monkeys every month with very small numbers of cercariae the excretion of eggs gradually increased and then after 224–396 days from the start it fell off, although the cercariae were now given in greater quantities. In a fourth monkey infected in this way, the production of eggs reached the fatal limit before sufficient immunity could be built up. Complete resistance was assumed to have been produced when strong superinfection failed to produce a corresponding excretion of eggs. This happened in 10 monkeys. In 9 of these the test infection was made with 1,000 cercariae which would surely have been fatal if given as a first infection. The resistant animals showed no ill-effects.

The time required for the production of the different grades of resistance varied in different animals. In 3 monkeys, exposed to many weak infections at monthly intervals, signs of strong resistance could be demonstrated in 9–12 months. Partial resistance was shown in 5 animals after 304–886 days, and complete resistance in 420–912 days.

Two monkeys were exposed during 689 or 425 days respectively to 10 or 12 infections totalling 2,405 or 1,628 male cercariae; 1 showed a moderate, and the other a high, partial resistance to a bisexual infection. A third monkey was exposed during 861 days to 9 infections totalling 2,138 male *S. japonicum* cercariae and twice with a total of 1,350 female *S. mansoni* cercariae; eggs were never found in the faeces; the monkey showed a high partial resistance to bisexual superinfection with *S. japonicum*.

From the proportion between the number of worms found at post mortem and the number of cercariae which were applied before resistance developed, it is concluded that the number of schistosomes in 6 monkeys decreased considerably during 2–6⅓ years. This decrease of number, which affects both sexes, and a diminution in the egg-production of the females are the causes of the diminished excretion of eggs already described. In 1 monkey which was killed 2 years after a single infection the male and female worms were smaller than those of 3 other monkeys which were killed in the third month after single infections. The worms were still smaller in 6 monkeys which had been infected many times, 379–2,321 days before autopsy; it is not clear in these resistant monkeys whether the worms had shrunk or had always been stunted. Two monkeys, which had become completely resistant to *S. japonicum*, exhibited high but incomplete resistance to *S. mansoni*.

In 2 monkeys an attempt was made to produce immunization by injection of schistosome material. The first monkey was inoculated with fresh minced (*S. japonicum*) worms, the second with a suspension of pulverized worms; 10 to 12 injections were given, part subcutaneously, part intraperitoneally, during 351 or 439 days, about 2,300 worms being injected into each animal. Test infections were then given, but no resistance could be detected as judged by the excretion of eggs. Another monkey was inoculated intravenously and intraperitoneally during 8 days with a serum from a highly resistant monkey, to a total amount of 21 cc. per kgm. A test infection which was applied 1½ hours after the first injection of serum led to a profuse excretion of eggs, and at post mortem on the 77th day it was found that 17 per cent. of the cercariae had ripened into full-sized worms. A similar experiment in which 2 mice were treated with immune serum was equally unsuccessful. Among the possible factors which might produce resistance, consideration may be given to the excretion of living worms and eggs and to the body substances of dead worms and eggs. The body substance of dead worms may be excluded, in view of the failure to produce immunity by this means as described above; even though 9–16 times as many dead worms (as living ones) had been injected as had been necessary to produce complete resistance in other monkeys. The experiments described, in which unisexual infection with male worms produced considerable resistance, show that resistance can be developed in the absence of eggs. However, it is possible that resistance may be provoked by the excretions of eggs as well as by those of living worms.

The white blood cell count was followed in 13 monkeys. Apart from 1 monkey, in which a massive infection caused death in 3 months, all animals showed eosinophilia, although to varying extents; 3 to 4 months after the beginning of infection there occurred a high plateau of the eosinophile curve in most monkeys, which lasted on the average 72 days. The maximal count was 18,000 eosinophiles per cmm. which was 58 times

the original level. This period of high eosinophilia is probably the expression of a phase of hyperergy [? hypersensitivity]. Possibly it corresponds to the feverish initial phase of human schistosomiasis, although in the monkeys there was no increase of temperature and no allergic cutaneous symptoms. In 6 monkeys there was a transient increase of eosinophilia after stronger superinfection also; it began earlier and lasted shorter than after the first infection. There was no correlation between the course of the eosinophilia and the intensity of egg excretion. Eosinophilia also occurred in the 3 monkeys infected only with male cercariae.

In 5 monkeys (including 1 with only male worms) the complement-fixation test became positive in 14–59 days days after the beginning of infection, the strongest reactions being observed between the 27th and 30th days. The temporal course of this reaction could not be correlated with the excretion of eggs or with acquired resistance.

Cercariae which have penetrated into the skin of the buttock produce no appreciable skin reaction as the first infection. On repeated superinfection the skin reactions are of different strengths. They consist of papules or lumps on the places where the cercariae have entered, and in the strongest reactions there is oedema of the abdominal skin and swelling of the regional lymph glands.

Superinfections in 2 resistant monkeys encountered complete resistance even if the cercariae were placed upon the skin which had not previously been exposed. The local limitation of the immunity reactions in the skin was thereby excluded. The resistance also persisted in full strength in a monkey in which 800 cercariae were placed on the surface of the intestine. As a control of this, a rabbit was exposed in the same way; it excreted eggs, and at autopsy 57 per cent. of the cercariae were recovered as ripe worms. Accordingly it is concluded that the defence processes of monkeys are effective even if the cercariae are applied in some other way than on the skin.

In order to investigate the fate of young schistosomes which had penetrated into resistant monkeys, 5 highly resistant monkeys were exposed to very strong infection, 4, 7, 10, 10 and 26 days before being killed. The different organs were examined for worms by perfusion, teasing apart, or histological section. The skin and groin glands contained a few cercariae on the 4th day. The lungs on the 4th and 7th days contained numerous nodules which consisted of an infiltration of eosinophiles and a schistosomulum lying in an arteriole. On the 10th day, neither nodules nor schistosomula were found. The liver contained no schistosomula on the 4th and 26th days and only 1–11 specimens on the 7th and 10th days. In contrast, the liver of a control rabbit infected by the same technique but with fewer cercariae contained 124 schistosomula on the 5th day. The results obtained with resistant monkeys differ from those obtained by Faust and Meleney [this *Bulletin*, 1925, v. 22, 468] in rabbits after first infection in 3 main points (1) in the occurrence of eosinophile nodules in the lungs, (2) in the complete absence of punctiform haemorrhages in the lung and gastric mucosa, and (3) in the very scanty number of schistosomula in the liver. Points 2 and 3 suggest that the schistosomula in resistant monkeys seldom get past the lung arterioles or capillaries. Presumably they are immobilized by a cellular or humoral factor and then killed.

In order to seek for a humoral factor the authors investigated the behaviour of *S. japonicum* cercariae in the sera of resistant, non-resistant, and non-infected monkeys. The mobility and life of the larvae persisted as long in the resistant sera as in normal sera. This experiment ought to be repeated with schistosomula. Similarly the investigation of passive

immunization ought to be repeated under better conditions. The appearance of the acquired resistance shows no temporal correlation with the cercarial-sheathing reaction (*Cercarienhüllen*), with complement fixation, or with the allergic reactions of the skin. If acquired resistance depends upon antibodies, then these latter must be different from those which underlie the 3 reactions mentioned.

In order to investigate whether the acquired resistance persists a long time after the death of all schistosomes, a monkey which had attained complete resistance was treated intensively with tartar emetic. The monkey was then subjected at long intervals to 7 test infections, the last one being 6½ years after the end of treatment. From the end of treatment to death from tuberculosis 8 years later (almost 10 years from the first infection) no single miracidium could be detected in the faeces during 315 examinations. At autopsy, no worms or eggs were found.

In comparison with these monkeys, observations are recorded on a patient, when the exact day of infection by *S. japonicum* was known and who had no subsequent opportunity for reinfection. During 16 years after the 3rd month from infection 37 stool examinations were made. Apart from short interruptions produced by therapy, eggs or miracidia were regularly present until 5 years 2½ months after infections, and then only on one single occasion 13 years after infection. In spite of therapy, the egg excretion in this lightly infected patient continued considerably longer than in the monkeys.

Epidemiological observations in the schistosomiasis regions of China suggest that a great part of the people, who are generally infected in youth, gradually overcome the infection, although they continue to be exposed to it. The similarity of the behaviour of the disease in men and monkeys, and the experimental evidence obtained in this work for the acquisition of a high grade resistance to superinfection raise the probability that a similar resistance can be acquired in man. *F. Hawking*

Salomé, B. Z. Het vóórkomen van schistosoma-dermatitis in Nederland. [**The Occurrence of Schistosome Dermatitis in the Netherlands**] *Nederl. Tijdschr. v. Geneesk.* 1953, Dec. 12, v. 97 (iv), No. 50, 3228–32, 1 fig. [23 refs.]

The English summary appended to the paper is as follows:—

"Schistosome cercariae were found in various places in the Netherlands, e.g. in the North-Western part of the province of Overijssel. They belonged to the ocellata and the gyrauli group. Exact determination of the species, however, was not feasible.

"Dermatitis was experimentally produced in human volunteers with two of these forms originating from the Naardermeer and from the Ijdoornpolder (North of Amsterdam).

"Reports from physicians and biologists showed that symptoms resembling those of schistosome dermatitis have been observed in several places in the Netherlands; they are especially frequent in N.W. Overijssel."

Macy, R. W. & Moore, D. J. **The Relationship between** *Trichobilharzia oregonensis* **and** *T. elvae*, **Etiological Agents of Schistosome Dermatitis in the Pacific Northwest.** *Science.* 1953, Nov. 27, v. 118, 650.

"*Cercaria*" *oregonensis*, which causes dermatitis in the human host in the North-west Pacific area, differs from the dermatitis-producing cercaria

of *Trichobilharzia elvae* in certain minor morphological characters and in the fact that it develops in *Physa ampullaria*, whereas the cercaria of *T. elvae* develops in *Lymnaea stagnalis* and *Stagnicola palustris elodes*. In order to obtain the previously undescribed adults of "*Cercaria*" *oregonensis*, cercariae discharged from naturally infected *P. ampullaria* were allowed to penetrate the skin of a series of ducklings. The adults which were eventually recovered from the venules of the intestinal wall of the birds were found to differ markedly from those of *T. elvae*, which had been obtained by exposing ducklings to cercariae discharged by snails infected with miracidia of *T. elvae* at a laboratory more than 300 miles from Oregon.

R. M. Gordon

Wu, Liang-yu. **A Study of the Life-History of *Trichobilharzia cameroni* sp. nov. (Family Schistosomatidae).** *Canadian J. Zool.* 1953, Aug., v. 31, No. 4, 351–73, 21 figs. [16 refs.]

"A cause of swimmer's itch in the lower Ottawa River is *Trichobilharzia cameroni* sp. nov. Its life cycle has been completed experimentally in laboratory-bred snails and in canaries and ducks, and the various stages are described. The eggs are spindle-shaped. The sporocysts are colorless and tubular. Mother sporocysts become mature in about a week. The younger daughter sporocyst is provided with spines on the anterior end and becomes mature in about three weeks. The development in the snail requires from 28 to 35 days. A few cercariae were found to live for up to 14 days at 50°C., although their life at 16° to 18°C. was about four days. Cercariae kept at room temperature for 60 to 72 hr. were found infective. The adults become mature in canaries and pass eggs in about 12 to 14 days. *Physa gyrina* is the species of snail naturally infected. It was found in one case giving off cercariae for five months after being kept in the laboratory. Domestic ducks were found to become infected until they were at least four months old, with the parasites developing to maturity in due course; no experiments were made with older ducks. Furthermore, miracidia were still recovered from the faeces four months after the duck had been experimentally infected, and it is suggested that migratory birds are the source of the local infection."

Olivier, L. & Weinstein, P. P. **Experimental Schistosome Dermatitis in Rabbits.** *J. Parasitology.* 1953, June, v. 39, No. 3, 280–91, 16 figs. on 3 pls. [17 refs.]

In this paper the skin reaction to penetration by avian schistosome cercariae and its relationship to the fate of the cercariae in unsensitized and sensitized rabbits are described. One rabbit was sensitized by the repeated application to the skin of the cercariae of *Trichobilharzia ocellata* and 5 rabbits were sensitized to the cercariae of *T. stagnicolae*. After sensitization had been achieved the animals were exposed again to the same species of cercariae; the macroscopic appearances of the lesions which resulted were recorded and histological studies were made on biopsies taken from the exposed areas at intervals during the following 2–3 days. Previously unexposed rabbits were exposed once to the same species of cercariae as controls and biopsies were made as in the sensitized animals.

The results showed that rabbits exposed for the first time developed no more than a very mild erythema with little or no cellular response around cercariae in the epidermis and corium; most of the cercariae were apparently alive even as late as 48 hours after penetration and there seemed to be no

reason why some of these should not continue their migration to the lungs, as described previously by the senior author [see this *Bulletin*, 1954, v. 51, 194]. In sensitized rabbits, however, exposure to cercariae resulted in dermatitis reactions comparable with those which occur in man. Macules appeared which were followed within 24 hours by a papular dermatitis with erythema and oedema. Cellular reactions of increasing intensity to cercariae in the epidermis and corium were observed in the skin biopsies; at 6 hours after penetration the tunnels in the epidermis containing cercariae were filled with leucocytes and there was a visible cellular infiltration around cercariae in the corium; at 24 and 48 hours, the reactions had increased greatly in intensity and most of the worms were apparently dead.

It was concluded that sensitized rabbits are apparently able to destroy avian schistosome cercariae in the skin; the immobilization and destruction of the worms may be effected by humoral factors or by the cellular response or by both.

The specificity of sensitivity to avian schistosomes in rabbits was also examined. Rabbits sensitized to the cercariae of *T. stagnicolae* were challenged simultaneously over separate areas to cercariae of *T. stagnicolae* and *T. ocellata*; typical papular dermatitis appeared in both areas showing that the reaction is not specific but " it must be borne in mind that the two schistosome species are very closely related taxonomically ".

R. B. Griffiths

Bersohn, I. & Lurie, H. I. **Experimental Bilharziasis in Animals. II. Correlation of Biochemistry (" Liver Function Tests ") and Histopathological Changes in the Liver in Early Bilharziasis.** *South African Med. J.* 1953, Oct. 24, v. 27, No. 43, 950–54, 6 figs. on 2 pls. [14 refs.]

" 1. Two monkeys were infected with *B. bovis* and weekly biochemical and histopathological studies were carried out for 25 weeks.

" 2. The earliest histological change was that of an acute hepatitis, followed by the deposition of numerous ova in the liver. This phase was followed by a giant-cell reaction, the phagocytosis and removal of the majority of ova, and later by the appearance of granulomata. No increase in fibrous tissue was observed.

" 3. Biochemical changes, especially involving protein metabolism, were observed to coincide with the formation of granulomata; certain of these changes suggest their being due to parenchymal liver damage, while others possibly reflect stimulation of the reticulo-endothelial system."

Yokogawa, M. **Studies on the Biological Aspects of the Larval Stages of *Paragonimus westermanii*, especially Invasion of the Second Intermediate Hosts. (II.)** *Japanese J. Med. Sci. & Biol.* 1952, Dec., v. 5, No. 6, 501–15, 3 pls. [26 refs.]

The incidence and distribution of metacercariae of *Paragonimus westermanii* in crustacean hosts in Shizuoka, Ehime and other prefectures is reported upon. The crabs examined were *Eriocheir japonicus*, *Potamon dehaani*, *Cambarus clarkii* and *Sesarma dehaani*. The incidence in *E. japonicus* far exceeded that in the other 3 species, even that of *P. dehaani* collected from the same locality. In *C. clarkii* the incidence was 2·2 per cent. in 90 examined and this is the first report of this species as a carrier in Japan. There was no correlation between incidence and size of crabs in the case of *E. japonicus*. The highest incidences in this species were

observed in September and October (93·9 and 93·1 per cent. respectively) and the lowest in April and July (44·4 and 10 per cent. respectively). The distribution of metacercariae in *E. japonicus* was analysed by counting the numbers present in different parts of the body and it was found that the gills were infected in 100 per cent. of 75 infected crabs; the legs in 77·3 per cent., the body in 70·6 per cent., the liver in 45·3 per cent., and reproductive organs in 9·3 per cent. A total of 5,352 metacercariae was found in the 75 crabs, being an average of 71·4. Observations were also made on sex incidence, the incidence on right and left sides of the body and on different gills.

Mature and immature metacercariae and degenerate cercariae were found in the gills of *E. japonicus* throughout the year with not marked seasonal fluctuations. The number of mature metacercariae was always higher than the others. In one specimen 1,304 metacercariae and cercariae were found, of which 591 were mature and 589 immature metacercariae; 107 were degenerate cercariae, 17 decaudated. Immature metacercariae and degenerate cercariae were seen mainly in the gill vessels and intestinal wall and never attached to the gill filaments, which does not support the theory that the cercariae invade the crabs by penetrating the soft parts of the body; the evidence in general suggests that the cercariae are ingested by the crustacean host. *J. J. C. Buckley*

Prats, F., Faiguenbaum, J., Rioseco, H. G. & Awad, T. Urticaria crónica por distomatosis hepática. [**Chronic Urticaria Caused by** *Fasciola hepatica* **Infection**] *Bol. Informaciones Parasitarias Chilenas.* 1953, July–Sept., v. 8, No. 3, 55–7.

Deschiens, R. & Poirier, M. Etude comparée des propriétés toxiques et éosinophilogènes de différents extraits de douves chez le cobaye. [**Comparative Studies in Guineapigs of the Toxic and Eosinophilogenic Properties of Different Extracts of Flukes**] *C.R. Soc. Biol.* 1953, June, v. 147, Nos. 11/12, 1059–61.

The following is a translation of the author's summary:—

(1) The glucido-lipido-polypeptide extract, aqueous extracts and trichloracetic extracts of *F. hepatica* exercise an eosinophilogenic action on the blood and marrow of guineapigs.

(2) The eosinophilogenic property seems to be more marked with the aqueous and the glucido-lipido-polypeptide extract than with the trichloracetic extract.

(3) The lesions provoked by the 3 types of extract are qualitatively comparable, but their intensity is more marked with the trichloracetic and glucido-lipido-polypeptide extract than with the aqueous extract.

[For previous papers on this subject see this *Bulletin*, 1949, v. 46, 850, 851; 1951, v. 48, 571, 658.] *H. J. O'D. Burke-Gaffney*

Stemmermann, G. N. **Human Infestation with** *Fasciola gigantica. Hawaii Med. J.* 1953, Sept.–Oct., v. 13, No. 1, 19–22, 5 figs.

A case of human infection with *Fasciola gigantica* is described. The patient was a middle-aged Japanese woman who died as a result of obstruction of the biliary tree by several flukes. Symptoms began 9 years before death, and included bouts of severe epigastric pain, fever and flatulence. Eosinophilia was present and a granuloma was noted in the liver

when a laparotomy was performed. A study of this case and others suggested that the lesion due to this infection has distinctive features and a detailed description of the pathology is provided. *J. J. C. Buckley*

Stemmermann, G. N. **Human Infestation with** *Fasciola gigantica*. *Amer. J. Path.* 1953, July–Aug., v. 29, No. 4, 731–59, 12 figs. [20 refs.]

The author gives detailed histories of 5 cases of human infection with *Fasciola gigantica*, in Hawaii, two of which are cases previously reported by Alicata [this *Bulletin*, 1953, v. 50, 634]. His study shows that the infection may be abortive and that it is probably more frequent than the figures given indicate. *F. gigantica* is normally present in cattle and swine in Hawaii, but not in man; but it is the commonest species of *Fasciola* in Hawaii. Man is infected by eating raw watercress in areas in which infected cattle roam freely. The migrating young flukes cause granulomata in the liver and elsewhere (*e.g.*, in the tail of the pancreas) and mature flukes may also occur in unusual sites.

The symptoms caused by the migrating young flukes are typical enough to make clinical diagnosis possible. They include intermittent attacks of intense abdominal pain, fever, nausea, vomiting, perhaps abdominal tenderness and profound eosinophilia. The author describes the tissue changes caused by the migrating young flukes and the adult flukes and discusses the differences between them. There are 20 references in the useful bibliography. *G. Lapage*

Kant, L. *Fasciolopsis buski* **in Saharsa District (North Bihar).** *Indian Med. Gaz.* 1953, Feb., v. 88, No. 2, 68–9.

" (1) An extensive area of Saharsa District is endemic home of *F. buski*.

" (2) The source of infection such as snails (planorbis) and the host such as wild boars and domestic pigs, are quite common in the affected areas.

" (3) The tubers, *saruk*, *karhar*, *ghechul*, chestnut and *bhent* are found frequently in the pools and tanks of the affected area. The cercariae encyst on these tubers and nuts which when peeled with the teeth, get access to the mouth and thus infection takes place.

" (4) Patients come with hook-worm and dysentery syndrome.

" (5) Majority of them are cured with 5 to 6 courses of hook-worm treatment.

" (6) A survey of the affected area is suggested."

Viranuvatti, V. & Mettiyawongse, S. **Observations on Two Cases of Opisthorchiasis in Thailand.** *Ann. Trop. Med. & Parasit.* 1953, Oct., v. 47, No. 3, 291–3, 3 figs. on pl.

The authors record 2 fatal human cases of carcinoma of the liver associated with infection with *Opisthorchis viverrina* occurring in Thailand, but they were not able to decide whether the association of these 2 conditions was more than a coincidence; they could not find any other reference to it in the literature available to them. They refer to the literature on infection with this species of fluke, which includes statements that human infection with *O. viverrina* is very common in north-east Thailand, and that not less than 1½ million of the 18 million people of Thailand are infected with it. *G. Lapage*

Sandars, Dorothea F. **Another Record of a Human Diphyllobothriid in Australia.** *Med. J. Australia.* 1953, July 11, v. 2, No. 2, 55–8, 6 figs.

An Estonian woman, 4 years resident in Queensland, was diagnosed as being infected with a Diphyllobothriid tapeworm by the finding of eggs in the stools. She had complained of not feeling well, emaciation, irritability, dizzy spells and " gnawing " abdominal pain which was usually relieved by food. Tapeworm segments had been noted in the stools. Blood examination showed a striking reduction in the neutrophile cells, which were only about 800 per cmm. Eosinophile cells were 1 per cent. Treatment with atebrin [mepacrine] and purgatives after a day's starvation and 2 days on a non-residue diet resulted in the removal of a tapeworm " of the *Diphyllobothrium latum* ' group ' ", measuring 105 cm. long with a maximum breadth of 2·9 mm. The uterus was not quite typical of that of *D. latum* but the egg measurements lay within the range of those of *D. latum*. The author discusses the variability in the morphology of Diphyllobothriid tapeworms and comments that the mature segments of the present specimen differ obviously from those identified as *D. latum* recovered from an Irish immigrant, recorded by herself in 1951 [this *Bulletin*, 1952, v. 49, 417].

Attempts to infect the local copepods, *Cyclops varicans*, with procercoids were unsuccessful. *J. J. C. Buckley*

Neghme, A., Silva, R. & Rodríguez, L. Datos sobre hidatidosis humana en 1952. [**Statistics of Human Hydatid Disease in Chile in 1952**] *Bol. Informaciones Parasitarias Chilenas.* 1953, July–Sept., v. 8, No. 3, 54–5.

The English summary appended to the paper is as follows:—

" Cases report of human hydatid disease from Chilean Hospitals during 1952 is given. 506 new cases were hospitalized with an average stay of 52 days at the Hospital and a death-rate of 6·72%."

Kajahn, Elisabeth. Ankylostomiasisbeobachtungen in Nord-Iran. [**Observations on Ankylostomiasis in Northern Iran**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Oct., v. 4, No. 4, 506–9.

Although the occurrence of ankylostomiasis in Northern Iran is known, the author could find only one proved Iranian record of its occurrence and this was in Southern Iran. Actually several millions of people there may be infected and the disease affects their capacity for work. The author records her observations made between September 1952 and May 1953 on the stools and blood of patients with ankylostomiasis in the hospital at Ramsar, near the Caspian sea.

Of the 395 patients examined, 196 (49·6 per cent.) had ankylostome eggs in their faeces, but anaemia was diagnosed in only 22·5 per cent. Anaemia was most severe in children and sexually active women suffering increased iron demand due to menstruation or child-bearing. A table shows that the haemoglobin values in children aged 18 weeks to 17 months varied from 20 to 45 per cent. The smaller and more predisposed the child, the most severe was the anaemia.

The author states that the anaemia must be treated before the worms are removed. The patients were treated with either " Tetracap ", ascaridol, ascarisin or oil of chenopodium, the doses of which are given, but the results were very unsatisfactory, the author ascribing this to inadequate dosage

and to the effects of other diseases. When worms appeared in the stools they were always *Ancylostoma duodenale*. *Necator americanus* was never found. In 5 patients *Trichostrongylus* was found, the species not being stated.

The author discusses her treatment of the anaemia of patients with less than 35 per cent. haemoglobin with iron given orally and intravenously. This treatment, in spite of unsatisfactory results of the anthelmintics used and the effects of the intravenous administration of iron, increased a series of haemoglobin percentages ranging from 20 to 40 per cent. to percentages varying from 40 to 65 per cent.

Northern Iran has a heavy rainfall in the winter and the streams bring water to the wide areas of tea plantations and rice fields, in which the vegetation favours the development of the ankylostome larvae. The author discusses prophylactic measures, such as education of the public, the wearing of rubber galoshes, abstinence from defaecation in the open and not letting small children lie naked in the open or on damp grass. *G. Lapage*

Galliard, H. & Berdonneau, R. Strongyloïdose expérimentale chez le chien. Effets de la cortisone. Résultats du test de Thorn à l'hormone corticotrope (A.C.T.H.). [**Effect of Cortisone and Results of the Thorn Test in Experimental Strongyloidoses in Dogs**] *Ann. Parasit. Humaine et Comparée*. 1953, v. 28, No. 3, 163–71, 3 figs.

The authors' summary in French is freely translated as follows:—

Experimental infection of 4 puppies from the same litter, with similar doses of the same strain of *Strongyloides stercoralis*, gave very different results: two became heavily infected, and retained the infection for 120 and 180 days, while in the other two the infection was weak and lasted for only 30 to 35 days. It is possible that treatment with cortisone, given to the first two animals when the infection was falling off, had some effect on its persistence. Moreover, the action of cortisone on a fifth dog, old and resistant to previous exposure with infective larvae, was quite definite; this animal became heavily infected but only for 40 days.

In the 4 puppies, the eosinophile rate was increased slightly, to 9 per cent., and to 14 per cent. in the old dog. In the 5 animals the peak of the curve, at about 25 days, and its return to normal after 40 to 45 days, were reached at the same time without any relation to the intensity or the duration of the infection.

Thorn's test with ACTH gave a negative result in all the infected animals and was positive in the cured animals. *J. J. C. Buckley*

Thorson, R. E. **Studies on the Mechanism of Immunity in the Rat to the Nematode,** *Nippostrongylus muris*. *Amer. J. Hyg.* 1953, July, v. 58, No. 1, 1–15. [27 refs.]

" Experiments were carried out in an attempt to obtain more information on the mechanism of immunity in the rat to the nematode, *Nippostrongylus muris*.

" Extractions of the bodies of infective larvae were made which yielded several fractions that gave positive precipitin reactions with serum from animals repeatedly infected with this worm. By absorption, it was not possible to relate antibodies to these fractions to the precipitates formed around living larvae in immune serum in the in vitro test. Secretions and excretions of infective larvae in normal serum and normal saline were used as antigens. They stimulated the formation of antibodies which gave partial

protection to rats against test infections of *N. muris*. The preparations of secretions and excretions of the infective larvae in saline possessed lipolytic activity which was inhibited by serum from rats that had been repeatedly infected with *N. muris*.

"As a result of these observations, the following hypothesis on the mechanism of nematode immunity was set forth. Antibodies produced by the host against the enzymes in the secretions and excretions of the worms would react against the enzymes of the invading larvae to slow down their migration and by affecting adversely their nutrition would interfere with their normal development. This would allow the host's reticulo-endothelial system to attack and encapsulate many of the larvae in the tissues and would prevent the worms that reached the intestine from establishing normal infections."

Kostić, D., Zlokas, D. & Jevtić, M. [**Helminth Eggs in Sewage Waters and Swimming Pools in Belgrade**] *Courrier Inst. Hyg.* Belgrade. 1952, Apr., v. 1, No. 1, 21–6, 1 fig. [In Serbian.] English summary.

Infestation with helminths is widespread in Belgrade, some suburbs of which have neither sewerage nor piped water supply, and where manuring of fields with raw sewage is standard practice. In a survey of children of school and pre-school ages the infestation rate ranged from 25 to 92·4 per cent. in different institutions. The commonest parasite was *Enterobius vermicularis* (70 per cent.), followed by *Trichuris trichiura* and *Ascaris lumbricoides*. Egg counts were carried out on samples from a main sewer which drains one-third of Belgrade, and also on water from 2 swimming pools. A 5-litre sample of sewage was treated with 25 per cent. antiformin and centrifuged; the sediment was resuspended in water and passed through a filter paper marked with 1 cm. squares, which was then examined with a magnification of 50 diameters while still wet. Samples from the swimming pools were examined similarly without previous treatment with antiformin. The sewage contained 4,415 eggs per litre, mostly *Ascaris* and some *Trichuris*; one swimming bath contained 46 eggs per litre (all *Ascaris*) but no eggs were found in the other. *D. J. Bauer*

Mendheim, H. & Scheid, G., with W. Rudolfsky. Untersuchungen über den Wirkungsmechanismus proteolytischer Fermente auf Spulwürmer. [**Studies of the Mode of Action of Proteolytic Ferments on Ascarids**] *Ärztl. Forschung.* 1953, Dec. 10, v. 7, No. 12, I/552–4, 5 figs. [15 refs.]

The authors discuss the structure of the cuticle of *Ascaris lumbricoides* and its resistance to the action of anthelmintics, referring to some of the earlier work on this subject and on the use of the fresh milk of *Carica papaya* by the Indians of Southern and Central America for the treatment of intestinal helminths. They add the results of their own *in vitro* work on the action of Nematolyt, a preparation containing active papain. Using living *Ascaris* from pigs, they kept these in warm and repeatedly-changed Ringer's solution to get rid of their excretory products and then exposed them to the action of the Nematolyt. The worms were then cut up and embedded and stained by the technique described. The authors concluded that the first changes caused by the papain occurred in the cuticle, these changes being more evident in the fibrous and innermost layers of the cuticle than in the two outer layers. As digestion proceeded, the subcuticle became vacuolated and was dissolved. Later this and the underlying muscular

layer was destroyed and the genital organs were extruded, these and the intestinal epithelium being also damaged. Still further digestion caused marked damage and finally the bodies of the worms were destroyed and became unrecognizable. The microscopic changes are illustrated.

G. Lapage

Brill, R., Churg, J. & Beaver, P. C. **Allergic Granulomatosis associated with Visceral Larva Migrans.** Case Report with Autopsy Findings of Toxocara Infection in a Child. *Amer. J. Clin. Path.* 1953, Dec., v. 23, No. 12, 1208–15, 6 figs. [14 refs.]

"The clinical and autopsy findings are presented in a 2-year-old child with a syndrome of eosinophilia and disseminated visceral lesions. Granulomatous lesions of specific structure were found in the heart, liver, kidneys and lungs, often in relation to a severely altered small vein. A Toxocara larva was demonstrated in one of the pulmonary nodules. In addition, extensive degeneration and a variable amount of inflammation were present in the voluntary muscles and the diaphragm.

"The case is interpreted as an example of allergic granulomatosis associated with visceral larva migrans."

Chabaud, A. G. & Choquet, Marie T. Nouvel essai de classification des filaires (superfamille des Filarioïdea). [**New Attempt to Classify Filarial Worms**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, No. 3, 172–92.

The authors' summary in French is freely translated as follows:—

For the generic diagnosis of filariid worms, the dichotomous keys of Yorke and Maplestone are out of date. Those of Skrjabin and Schikhobalova are in Russian, in a book difficult to obtain, and are based on characters which seem too artificial. On the other hand the grouping into families and sub-families proposed by Wehr seems very satisfactory, for these groups seem to correspond with the evolutionary processes undergone by the spirurid worms which are adapted to living in tissues. These divisions are therefore less artificial and result in relatively homogeneous groups.

It seemed useful to provide new dichotomous keys in which the general scheme published by Wehr was utilized. All the families and sub-families proposed by that author are retained, with the exception of the Dipetalonematidae, which are divided into six sub-families: the *Cardionematinae*, the *Oswaldofilariinae*, the *Dirofilariinae*, the *Dipetalonematinae*, the *Splendidofilariinae* and the *Onchocercinae*. For philogenetic and practical reasons, these divisions are generally based on the length of the tail.

Eighty-nine valid genera are accepted; 30 genera are placed in synonomy; the genus *Deraïophoronema* is brought back to accommodate *Filaria evansi* (Lewis, 1882). The group of species formerly placed in the genera *Splendidofilaria*, *Chandlerella*, *Parachandlerella*, *Vagrifilaria* and *Paramicipsella* is revised and the species are distributed simply between the two genera: *Splendidofilaria* and *Paramicipsella*.

J. J. C. Buckley

Galliard, H. & Chabaud, A. G. Sur la morphologie de *Wuchereria bancrofti* (Cobbold) provenant du Tonkin et de Tahiti. [**Morphology of** *W. bancrofti* **from Tonkin and Tahiti**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, No. 3, 237–9, 1 fig.

The morphology of a male and a female *Wuchereria bancrofti*, removed from a native of Tahiti where filariasis is of the non-periodic form, was

examined in the light of the suggested differences [Buckley, this *Bulletin*, 1952, v. 49, 1061] between adults of the periodic and non-periodic varieties of this worm. The male had a length of 31·5 mm. and the female 76·5 mm. and these measurements fall within the range given by Buckley for the periodic and outside that of the non-periodic variety. Moreover, the tail of the female had a bulbous swelling and the *en face* view of the head was sub-circular, not oval, both of which characters had been suggested by Buckley as being possibly characteristic of the periodic variety of *W. bancrofti*.

J. J. C. Buckley

Chow, C. Y. *Pistia* **Clearance with Herbicides in Rural-Filariasis Control.** A Preliminary Note. *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 4, 571–3.

"Of a number of herbicides used in *Pistia* clearance, as a control measure of rural filariasis (*Wuchereria malayi*) in Ceylon, Phenoxylene 30 (MCPA) and 2,4-D amine salt were found to be the most effective, cheapest, and easiest to handle. 56 ml. (2 fluid ounces) of Phenoxylene 30, and 28 ml. (1 fluid ounce) of a wetting agent ("Teepol"), were added to 4·2 litres (approximately 1 Imperial gallon) of water, and 163 litres (36 gallons) were sprayed over 4,046 m² (1 acre) of water covered with *Pistia*. It is much more effective to spray young *Pistia*, which will be killed in about a week. Excellent results were obtained, during a large-scale field experiment, with a single application. The total cost per acre was Rs20, being only one-sixth that of manual removal. The methods of application are described."

Crosnier, R., Darbon, A., Dulac, J. F. & Quilicchini, F. Filariose *Loa* et amibiase, incidences du traitement par la Notézine. [**Loiasis and Amoebiasis: Episodes in Treatment with Diethylcarbamazine**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 702–8.

This is an account of a man who acquired a *Loa loa* infection and amoebiasis in West Africa. The former had previously been treated unsuccessfully with Notézine [diethylcarbamazine], and the latter had caused an episode of "presuppurative hepatitis". He was treated by the authors with emetine and oxytetracycline and then diethylcarbamazine; he developed liver and pulmonary lesions thought to be due to his amoebiasis, so was treated with aminoxyconessine and aureomycin, seemingly with a satisfactory result. It was noted that when he originally had had Notézine treatment there had been lung and liver symptoms thought to be due to the destruction of the filarial parasites, so the authors concluded that these lesions on the second occasion were probably of double causation.

A. R. D. Adams

Fain, A. Observations sur *Hepaticola hepatica* (Bancroft 1893) Hall 1916 au Congo Belge. [**Observations on *Hepaticola hepatica* in the Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1953, Apr. 30, v. 33, No. 2, 107–17, 3 figs. on 2 pls. [26 refs.]

The author gives a general account of the life cycle and pathology of *Hepaticola* [*Capillaria*] *hepatica* and lists its known hosts, 16 in number, which include man, in whom the parasite has twice been recorded [this *Bulletin*, 1924, v. 21, 963; 1951, v. 48, 183]. *H. hepatica* is here recorded as being found in the liver of 9 new hosts in Blukwa (Haut-Ituri), 8 of which are rodents and one is a species of *Dendrohyrax*. Examinations of jackals, dogs, wild cats and 3 kinds of insectivores were negative, as were

16 species of bats. The eggs found in the liver of *Dendrohyrax* were larger than usual and may represent a new species of *Hepaticola*. Experimental work was carried out with white mice and dogs; the whole life cycle was completed in white mice. Observations were made on the incubation period of the eggs, and their viability after passage through the intestinal tract of mice and dogs. The characteristic lesion is a foreign body granuloma. The lesions are not correlated with intensity of infection but seem to be more dependent on the nature of the host, *e.g.*, the natural hosts (*Mastomys*) have few lesions even when infection is very heavy, while white mice and rats and also *Dendrohyrax* react very strongly to the presence of the parasites in the liver.

In a footnote the author adds that *H. hepatica* has since been found in Ruanda-Urundi in the liver of an *Otomys tropicalis elgonensis*.

J. J. C. Bučkley

Sillman, E. I. **A Korean Case of Infestation with** *Thelazia callipaeda* **with Notes on Human Thelaziasis.** [Research Notes.] *J. Parasitology.* 1953, Dec., v. 39, No. 6, 669–70.

Basnuevo, J. G., Cowley Chávez, O., Blanco Rabassa, E., Achkar, R. & Soler Delgado, F. La mezcla Hexilresorcinol, Acacia, Kaolín e Hidróxido de aluminio (Santokín), en el tratamiento de la Tricocefaliasis. [**The Mixture Hexylresorcinol, Acacia, Colloidal Kaolin and Colloidal Aluminum Hydroxide (Santokin), in the Treatment of Trichocephaliasis**] *Rev. Kuba Med. Trop. y Parasit.* 1953, Jan.–June, v. 9, Nos. 1/6, 3–12, 8 figs. [17 refs.] English summary.

The authors have previously recorded successes in the treatment of trichuriasis with high enemata of hexylresorcinol with gum acacia, colloidal kaolin and aluminium hydroxide [see this *Bulletin*, 1951, v. 48, 1137]. In their earlier cases a preliminary enema was given, watched by fluoroscopy, to determine the amount needed to reach the caecum. They now find this unnecessary and gauge the amount by the weight of the patient, 15–20 cc. per lb., or for very thin subjects another 5 cc. per lb. For those " over 80 pounds 1,200 to 1,500 should be used ". Another method is to gauge by age, or what the authors call " apparent age ", 150 cc. for each year up to 5; 125 cc. up to 10 years, 100 cc. per year for those over 10 years of age, the adult dose being, as before, 1,200 to 1,500 cc. They give 2 formulae which they have found effective in 200 cases:—

(a)	Hexylresorcinol (Santokin)	3 gm.
	Acacia	90 ,,
	Colloidal kaolin	30 ,,
	Colloidal aluminium hydroxide	30 ,,
	Tepid water	900 cc.
(b)	Hexylresorcinol	3 gm.
	Barium sulphate	90 ,,
	Tepid water	900 cc.

Cure, evidenced by failure to find any ova in the faeces after examination at fortnightly intervals, *may* be obtained by a single enema, but it is more usual to have to administer 3 or even 5 enemata at 10-day intervals. A table gives details of 50 children up to 5 years of age so treated and shows the ages, the weight, the volume of the enema, the amount per lb. weight and for year of age, the number of enemata needed to bring about cure; these ranged from 3 to 13; 2 only were cured with two. *H. Harold Scott*

White, R. H. R. & Standen, O. D. **Piperazine in the Treatment of Threadworms.** [Correspondence.] *Brit. Med. J.* 1953, Dec. 5, 1272–3.

The authors discuss reports of side effects of piperazine hydrate given for the treatment of infections with *Enterobius vermicularis* [this *Bulletin*, 1954, v. 51, 86]. The side effects were mild and recovery from them was rapid. They included giddiness, lack of coordination, sickness, inability to focus vision and a sense of detachment. Reports of these side effects are, in relation to the considerable number of cases treated, few; they were recorded in 14 adults and 6 children.

The authors attribute them to overdosage caused by: (1) the fact that the heavy syrup in which the drug was given forms a high meniscus in the spoons in which it was measured, and to variations in the capacities of these spoons. An interesting table shows that the contents of 9 domestic tablespoons taken by the authors from different households and filled level with water varied from 4 drachms 20 minims to 6 drachms 40 minims; and that, when these spoons were filled to the maximum with heavy piperazine syrup, their contents varied from 8 drachms to 9 drachms 50 minims. Thus the largest of the spoons gave a dose nearly 2½ times the intended dose of 4 drachms. The syrup should therefore be measured in a graduated medicine glass. (2) Variations in the weights of the patients, which must be taken into account, a dose of 50 to 75 mgm./kgm. being recommended by the authors.

G. Lapage

Coutelen, F., Biguet, J. & Lefrançois, J. Remarques sur l'emploi comme oxyuricide du sulfate d'aluminium ortho-oxyquinoléine. [**Comments on the Use of Aluminium Ortho-Oxyquinoline Sulphate in the Treatment of Enterobiasis**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 713–16.

It has been claimed by several workers that aluminium ortho-oxyquinoline sulphate, a substance which has considerable bacteriostatic and bactericidal properties, is also of great value in the treatment of enterobiasis. A rate of cure of over 80 per cent. has been reported and a further advantage of the drug is that it is practically non-toxic.

The value of the treatment in enterobiasis was re-tested by the authors of this paper on 25 male children aged from 4 to 14 years of age; they controlled the trial by the adhesive " Cellophane " tape method of Graham. The results were disappointing as only 6 of the 25 children could be regarded as cured. Of these 6 cures, 5 were in children aged 4 to 10 years, *i.e.*, 33 per cent. of this age group, and 1 cure only among the 10 children aged from 12 to 14.

It was confirmed that the drug is easily given in a syrup or in granules and causes no toxic symptoms. The first course of treatment was 1·5 gm. in 3 divided doses daily for 5 days for children aged less than 6 years, followed by a second course of the same dosage after 10 days and a third course after a further 10 days. Children aged 7 to 10 years were given twice this dosage and older children received 4·0 gm. per day.

M. E. Delafield

DEFICIENCY DISEASES

Lal, S. B. **Consumption Level of Depressed Classes (Nonia and Chamar) in Champaran (Bihar).** *J. Indian Med. Ass.* 1953, Sept., v. 22, No. 12, 492–5.

This is a continuation of the author's studies of the food intake of Bihari peasants [see this *Bulletin*, 1951, v. 48, 1138]. As famine is never very far away in Bihar, the importance of such surveys is clear. The 2 groups at the time of the survey, October–December 1949, appear to have been at least temporarily and relatively prosperous. The level of calorie intake (3,500 and 2,865 calories per consumption unit per day) was more than adequate, though in most other respects the diets were unbalanced.

R. Passmore

Lal, S. B. **Nutritional Oedema and Consumption Level in yet another Food Scarcity Area of Bihar.** *Indian Med. Gaz.* 1953, Sept., v. 88, No. 9, 475–80. [12 refs.]

A diet survey was carried out in the Darbhanga district of Bihar on 100 families in July and August 1951. Owing to failures of the two previous rains there was great scarcity. In those families with land holdings of less than 3·5 acres, daily food intake was only 1,156 calories per consumption unit. The figure for families with more land was 2,166 calories. From these families 81 adults were studied in detail. Twenty-one of these presented famine oedema. These was great emaciation, average weights for the males being 96·0 lb. and females 88·2 for those without oedema. For those with oedema the weights were not significantly different. Mean haemoglobin values were 14·1 gm./100 ml., and serum protein 5·79 gm./100 ml. for the non-oedematous and the figures for those with oedema did not differ. It is concluded that the oedema was of nutritional origin and "probably due to the increased permeability of the tissue cell".

R. Passmore

Delon, J., Calderon, C., Menguy, Y., Lafferre, M. & Blaise, C. Traitement de la Maladie Oedémateuse du Sevrage par le plasma intrapéritonéal. [**Treatment of "Oedematous Disease of Weaning" (Kwashiorkor) with Intraperitoneal Plasma**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1953, Nos. 26/27, 898–9.

The *maladie oedémateuse du sevrage* of North Africa is similar to kwashiorkor. In 1951, the authors, in Casablanca and in Louis-Gentil, Morocco, treated this condition by means of intraperitoneal injections of blood plasma, because of the difficulty or inaccessibility of methods involving other routes.

The technique consists in injecting unheated plasma into one of the iliac fossae, fairly rapidly (average time, half an hour). The plasma used contained 35–40 gm. of protein per litre and the dosage was 150 to 300 cc. twice a week or sometimes 30–40 cc. daily, repeated as required. In severe cases, 1 litre has been given in a month. Reactions were few: occasionally vomiting occurred at the first injection and very rarely there was a transient abdominal distension after 4 or 5 injections.

In Casablanca, 9 of 16 infants treated recovered and 7 died: in Louis-Gentil, 9 of 12 recovered and 3 died.

The authors state that general improvement was spectacular even in apparently moribund infants: secondly, the level of the blood proteins rose

rapidly and the patient's condition seemed to be restored when these proteins reached 55 gm. per litre.

The authors point to the value of such a method of treatment in a disease with such high mortality, especially as it is simple and needs far less supervision than " vascular or osseous perfusions ".

H. J. O'D. Burke-Gaffney

HAEMATOLOGY

Bessis, M., Bricka, M., Breton-Gorius, J. & Tabuis, J. **New Observations on Sickle Cells with special reference to their Agglutinability.** *Blood.* 1954, Jan., v. 9, No. 1, 39–45, 4 figs. [14 refs.]

" Observations made on sickle cells with phase contrast and with the electron microscope lead to the following conclusions.

" 1. When the red cell sickles, its oscillatory movements cease.

" 2. Spherical red cells give rise to a special form of sickle cell.

" 3. Myelin forms, whether attached to the cell or free, become rigid when the tension of oxygen is reduced.

" 4. The electron microscope, combined with the technic of moulage, shows that the sickle cell contains striated rod-like structures, which give a characteristic appearance to the surface of the sickle cell.

" 5. Agglutination by appropriate antisera does not occur to any extent in sickled cells, because these rigid structures do not form myelin forms. This is additional evidence of the importance of the formation of viscous surface layers already described as part of the mechanism of agglutination."

Ascenzi, A. & Silvestroni, E. **On the Optical Properties of the Hemoglobin in Microdrepanocytic Disease.** *Blood.* 1953, Dec., v. 8, No. 12, 1061–6, 2 figs. [28 refs.]

" In analogy with sickle cell anemia of the Negro, white carriers of the sickle cell trait and patients with microdrepanocytic disease show sickling which is associated with the presence of type S hemoglobin. The sickled cells are birefringent and the reduced hemoglobin forms tactoids which reveal a striking resemblance to the sickled erythrocytes.

" The mean retardation of each sickled red cell is $7{\cdot}5 \pm 0{\cdot}15$ mμ and the birefringence is approximately 0·0037."

Rice, S. M. **Healing of Chronic Sicklemia Leg Ulcers with Cortisone Therapy.** *Arch. Dermat. & Syph.* 1953, Nov., v. 68, No. 5, 576–9, 2 figs. [Refs. in footnotes.]

" Cornbleet [this *Bulletin*, 1952, v. 49, 716] recently described complete spontaneous healing of a chronic sickle-cell-anemia ulcer of two years' duration with the onset of pregnancy. Another recent article by Sass [*ibid.*, 795] described the beneficial effects of cortisone and corticotropin (ACTH) on sickle-cell anemia and concluded that they both had a place in the treatment of sickle-cell anemia. This article describes the effects of cortisone on chronic leg ulcers of four months' duration in a case of sicklemia in which no previous therapy had been of any value."

Lichtman, H. C., Watson, R. Janet, Feldman, F., Ginsberg, V. & Robinson, Jean. **Studies on Thalassemia. Part I. An Extracorpuscular Defect in Thalassemia Major. Part II. The Effects of Splenectomy in Thalassemia Major with an Associated Acquired Hemolytic Anemia.** *J. Clin. Investigation.* 1953, Dec., v. 32, No. 12, 1229–35, 6 figs. [24 refs.]

"1. Five patients with thalassemia major in whom an extracorpuscular type of hemolytic anemia was demonstrated, were subjected to surgical removal of their spleens.

"2. The requirements of four of these patients for supportive blood transfusions were markedly reduced. One patient was unchanged clinically.

"3. The survival of transfused erythrocytes was measured in two instances after splenectomy. In one instance the transfused erythrocytes were found to have a normal life span after operation as compared to a total survival of 33 days before splenectomy. In the second patient who was not benefited by splenectomy there was no significant change in the survival of transfused erythrocytes."

EPIDEMIC DROPSY

Chakravarti, R. N. **Aetiological Rôle of Toxic Oils in Epidemic Dropsy.** A Review. *Indian Med. Gaz.* 1953, Mar., v. 88, No. 3, 117–26. [Numerous refs.]

The causation of epidemic dropsy has been a subject of discussion since Colonel MacLeod of the Indian Medical Service described the condition early in the 1880's, and the rôle of toxic oils since *Argemone* seed and the expressed oil became incriminated as an adulterant of mustard oil for cooking fats in India. As stated in the title this article is a review of the subject and puts the whole question clearly. The various chemical, biological and fluorescent tests are described, the first including the nitric acid test, the copper acetate test, the ferric chloride test, the hydrochloric acid and bromide-bromate tests [see this *Bulletin*, 1946, v. 43, 953]. The subject has been often dealt with in this *Bulletin*. [See specially 1950, v. 47, 774, where many previous references are given.] The author next gives an account of the isolation and chemical properties of the alkaloids of *Argemone mexicana* and their biological action and, finally, mineral oil poisoning, "bloomless oil", and "white oil".

The review is a very able one and complete, but is not intended to bring forward any fresh evidence. All those interested in the subject should read the article and refresh their memories of the stages of the investigations of the past 70 years. *H. Harold Scott*

VENOMS AND ANTIVENENES

Mohammed, A. H., Rohayem, H. & Zaky, O. **The Influence of the Egyptian Scorpion and Cobra Venoms on the Mammalian Erythrocytes** *in Vitro.* *J. Trop. Med. & Hyg.* 1953, Oct., v. 56, No. 10, 242–4.

Suspensions of washed human and rabbit erythrocytes were tested *in vitro* against dilutions of scorpion (*Buthus quinquestriatus*) and cobra (*Naja tripudians*) venom.

Both venoms lysed human and rabbit erythrocytes. Human serum inhibited the lytic activity of the scorpion venom but not that of the cobra venom. Rabbit serum showed no inhibitory activity against either venom.

The author discusses these results in the light of the observation of Kellaway and Williams [this *Bulletin*, 1934, v. 31, 101] that cobra venom would lyse mammalian erythrocytes and that this lysis could be inhibited with homologous serum. *B. G. Maegraith*

Kuwajima, Y. **Immunological Researches on the Main Formosan Poisonous Snakes, especially on the Venoms. I. Classification of Poisonous Snakes in Formosa by means of Serological Methods based on Employing Snake Blood-Sera as Antigens.** *Japanese J. Exper. Med.* 1953, Feb., v. 23, No. 1, 21–5.

"In short, the precipitation test revealed that it was difficult to obtain a clear-cut result in differentiation of snakes, although a Family specificity seems to some extent to be observed. On the other hand, the complement fixation reaction gave a definite specificity of species and showed a close relationship between different species. Moreover, it seems that a Genus specificity could be demonstrated clearly."

Kuwajima, Y. **Immunological Researches on the Main Formosan Poisonous Snakes, especially on the Venoms. II. Coagulin and Blood Coagulation Inhibiting Factor in the Venoms of the Formosan Poisonous Snakes.** *Japanese J. Exper. Med.* 1953, Apr., v. 23, No. 2, 127–36. [17 refs.]

"The distribution of coagulin, proteolysin and coagulation inhibiting factor in the venoms of the Formosan poisonous snakes is summarized in Table 5.

TABLE 5

Venom of	Coagulin	Proteolysin	Coagulation inhibiting factor
Naja naja atra	absent		present
Bungarus multicinctus	absent		absent
Vipera russellii formosensis	present		
Trimeresurus mucrosquamatus	absent		present
Trimeresurus gramineus	present	present	absent
Ancistrodon acutus	present	present	absent

"The coagulin in the venom of Ancistrodon acutus and Trimeresurus gramineus is thermolabile, but the thermolability of the former is more marked than that of the latter. However, the coagulin of the former is antigenically quite identical with the latter. On the other hand, the coagulation inhibiting factor of Trimeresurus mucrosquamatus and Naja naja atra is extremely thermostable, showing a marked antigenic specificity. Polyvalent antivenin to the venoms of Bungarus multicinctus and Trimeresurus gramineus deficient in the coagulation inhibiting factor could neutralize the coagulation inhibiting action of Trimeresurus mucrosquamatus and Naja naja atra, they being originally independent antigenically from each other in the corresponding monovalent serum."

Mueller, H. L. & Hill, L. W. **Allergic Reactions to Bee and Wasp Stings.** *New England J. of Med.* 1953, Oct 29, v. 249, No. 18, 726–31, 3 figs. [23 refs.]

Severe reactions, sometimes resulting in death, from bee and wasp stings appear to be becoming increasingly common in the United States. [Most persons become tolerant to repeated bee stings, but a small minority exhibit this hypersensitivity, which may necessitate a bee-keeper changing his employment.] Attempts at desensitization have given varyingly successful results, perhaps because sometimes it has not been possible properly to identify the species of hymenopteran causing the trouble. This paper discusses earlier work, and describes the result of treating 7 children, who are receiving a course of 32 monthly injections of bee and wasp extract. In the normal course the injections are increased from 0·05 cc. of 1 in 1,000,000 dilution to 0·40 cc. of 1 in 10, but some persons cannot tolerate the higher concentration. The children give a decreased reaction to the extract during the course of the treatment, and those who have been stung by bees or wasps appeared less sensitive than before treatment. It is not clear whether bee extract can desensitize against wasp stings and *vice versa*, hence the use of the mixed extract. Seven commercial firms in the United States preparing bee and wasp extracts for desensitizing are listed.

Kenneth Mellanby

Asahina, S. **On a Remarkable Case of the biting of a Parasitic Wasp, *Sclerodermus nipponensis* Yuasa in Tokyo (Hymenoptera Bethylidae).** *Japanese J. Med. Sci. & Biol.* 1953, Apr., v. 6, No. 2, 197–9, 4 figs. on pl.

In June 1952, the ant-like wingless females of a parasitic wasp, *Sclerodermus nipponensis* were found infesting 23 rooms in the School for the Deaf and Dumb, Otsuka, Tokyo. They were crawling on the floor and on the furniture and if they were disturbed on the human body they stung intensely. Altogether the plague lasted two months and affected 340 people (40 teachers, 200 scholars and 100 parents).

The sting [not " bite "] caused the formation of a pale reddish swelling about 10 mm. in diameter and though the pain did not persist the injury often led to suppuration and even to lymphatic inflammations. Other cases due to the same species of wasp have since been reported from other parts of Japan.

In this instance the wasp was found to be inhabiting the galleries made by a beetle (*Ernobius mollis*) in the pine wood rafters of the school building. From this evidence it is assumed that this beetle is the host insect of the wasp.

DDT oil solution on the floor and BHC dust were fairly successful in the reduction of the pest but it is obvious that other methods will have to be employed to deal with the rafters infested with beetles. *H. S. Leeson*

Southcott, R. V. **Fatal Stings to North Queensland Bathers.** [Correspondence.] *Med. J. Australia.* 1952, Feb. 23, v. 1, No. 8, 272–4, 1 fig. [12 refs.]

Marine stingings due to medusae in North Queensland are reviewed. About 100 cases of presumed medusa stingings were seen at Palm Beach, north of Cairns, Queensland, in the summer of 1943/1944 in service personnel. These stingings were classified into two clinical groups. Type A

(unknown cause) comprised the great majority; in this there were severe constitutional effects with rapid recovery, wealing being absent. Symptoms were delayed onset, pain, vomiting, excessive sweating, etc. Type B (only a few cases) had local wealing, but no general constitutional effects, and were ascribed to a Carybdeid medusa. One Carybdeid medusa (*Chiropsalmus* sp.) was captured, and reproduced Type B effects when applied to the arm. This medusa is figured; it is apparently an undescribed species. It is suggested that this species is responsible for most of the fatalities from medusa stinging recorded from North Queensland. It is thought that the severity of the stinging may be seasonal. The common local jellyfish is identified as *Pseudorhiza* sp., found experimentally to be innocuous to man. No other species of jellyfish was captured. *R. V. Southcott*

TOXOPLASMOSIS

Andersen, B. & Ugland, J. **A Case of Congenital Toxoplasmosis.** *J. Oslo City Hosps.* 1953, Dec., v. 3, No. 12, 247–50, 2 figs.

"A typical case of congenital toxoplasmosis is reported, the third one observed in Norway."

Lelong, M., Le Tan Vinh, Desmonts, G. & Thompson, D. **Toxoplasmosis and Jaundice of the Newborn.** *Proc. Roy. Soc. Med.* 1953, Dec., v. 46, No. 12, 1056–8 (Sect. Paediatrics 38–40), 4 figs.

"A case of toxoplasmosis in a newborn infant with icterus gravis is described, the diagnosis having been established by smears, histological sections and by inoculation of mice.

"Toxoplasmosis must be considered in the differential diagnosis of pathological jaundice in the newborn, particularly with hepato-splenomegaly. Some similar observations have been recorded in the literature.

"Congenital hepatic cirrhosis may be a sequel to toxoplasma infection.

"The infection of the baby must be haematogenous, that is septicaemic, showing signs of generalized disease, otherwise the finding of lesions in such diverse situations as the central nervous system, liver, heart and skeletal muscles cannot be explained."

Stanton, M. F. & Pinkerton, H. **Benign Acquired Toxoplasmosis with Subsequent Pregnancy.** *Amer. J. Clin. Path.* 1953, Dec., v. 23, No. 12, 1199–207, 4 figs. [20 refs.]

"A case is described of benign toxoplasmic infection in a woman who subsequently became pregnant. The diagnosis was made by identifying the organism in an excised lymph node and was confirmed by serologic dye tests. Forty-three weeks after the appearance of clinical signs of the infection, the patient gave birth to an apparently normal infant showing a significantly high titer in the serum dye test. Histologic changes in the lymph node from the mother are described and are thought to be sufficiently characteristic to suggest toxoplasma infection."

Thiermann I., Erica & Christen A., R. Influencia de la edad, del sexo y de las vías de inoculación en el curso de la toxoplasmosis experimental del ratón. [**Influence of Age, Sex and Route of Inoculation on the Course of Experimental Toxoplasmosis in Mice**] *Bol. Informaciones Parasitarias Chilenas.* 1953, July–Sept., v. 8, No. 3, 45–9. [12 refs.]

The English summary appended to the paper is as follows:—

"The influence of age, sex and route of inoculation in experimental *Toxoplasma gondii* infections in mice was studied. None of these factors showed a great influence on the infection obtained, although the best results were obtained when intraperitoneal or intracerebral routes were used."

Christen A., R. & Thiermann I., Erica. Quimioterapia experimental de la toxoplasmosis. II. Efecto de la Acromicina sobre la toxoplasmosis experimental del ratón. [**Effect of Achromycin in Experimental *Toxoplasma* Infection in Mice**] *Bol. Informaciones Parasitarias Chilenas.* 1953, July–Sept., v. 8, No. 3, 49–51.

The English summary appended to the paper is as follows:—

"Achromycin was used as a chemotherapeutic agent in mice experimentally infected with *Toxoplasma gondii*. With a dose of 1·5 and 3 milligrams daily, a longer survival time was obtained, but the drug failed to cure the infection. No toxic effects were observed."

[See also this *Bulletin*, 1953, v. 50, 690.]

DERMATOLOGY AND FUNGUS DISEASES

Purandare, N. M. & Deoras, S. M. **Rhinosporidiosis in Bombay.** *Indian J. Med. Sci.* 1953, Nov., v. 7, No. 11, 603–10, 3 figs. on pl. [23 refs.]

Rhinosporidiosis (*Rhinosporidium seeberi*) is not rare in Bombay, and the authors were able to study 100 specimens from this disease, collected between 1930 and 1952.

The anatomical sites affected in the 100 cases were: the nasal passages or the nasopharynx in 91, conjunctiva in 3, lachrymal sac in 2, and the lip, larynx alone, urethra and skin in 1 case each. In this series of cases, 99 of the 100 patients were males, and it is noteworthy that the rarity of the disease in the female has been remarked by several observers. The youngest patient was a boy aged 7, the oldest a man of 69, and 47 of the 100 were in the age group 21 to 30 years.

Of epidemiological factors, the disease seems to have no significant association with a particular race or occupation, except that a large proportion of the patients have been engaged in some form of agriculture. Rhinosporidiosis occurs in cattle and horses, but direct transmission from animal to animal or from animal to man has never been known, and attempts at experimental transmission have always failed. Nothing is known of a saprophytic life of the fungus and it has been found only as a parasite. However, because of the common situation of the lesions, it has been contended that the infection may be air-borne (with dust) or water-borne; the latter hypothesis appears the more plausible. Trauma of the mucosa may play a part in the establishment of the infection.

Treatment by excision and cauterization is difficult in the case of the larger polypi and is, on the whole, far from satisfactory. In the present series, the ultimate results of treatment were not observed.

Of the 100 cases, particular interest was centred on the patient with laryngeal involvement, in which no other part was affected. The polyp was attached to the ventricular surface just above the left vocal cord, and it caused obstruction which necessitated an emergency tracheotomy. Involvement of the urethra is a rare condition and in the single instance in the present series the pedunculated tumour was small and protruded from the external meatus. Infection of the skin is uncommon and it is usually associated with lesions on a contiguous mucous membrane, but the case described by the authors was unique in that there was a generalized infection of the skin but no nasal lesion. Swellings in the skin occurred on the face, thorax, abdomen, back, and both arms, and sections of these showed the characteristic histopathology of rhinosporidiosis.

J. T. Duncan

Ricardo Steinberg, I., Ink, J., Iaricci, V. & Ygobone, A. Sobre un caso de Enfermedad de Wernicke-Posadas. Coccidiomicosis. Su estudio clínico, bacteriológico y anátomo-patológico. [**Study of A Case of Coccidioidomycosis from the Clinical, Bacteriological and Pathological Aspects**] *Semana Méd.* 1953, Nov. 5, v. 103, No. 19, 669–70, 683–4, 5 figs.

A case in Argentina, where it is said to be rare.

Azulay, R. D. Dois casos de micose de Lutz (Blastomicose brasileira) submetidos à traquetomia. [**Two Cases of South American Blastomycosis Requiring Tracheotomy**] *Hospital.* Rio de Janeiro. 1952, Dec., v. 42, No. 6, 923–9, 1 fig. [11 refs.] English summary.

The author describes two cases of Lutz's disease (South American blastomycosis) in which obstruction of the larynx, necessitating tracheotomy, was an outstanding complication.

The patient in case 1, a man aged 54 living in Rio de Janeiro, had suffered for 6 months from dysphonia with cough and expectoration. Two months before examination the symptoms became aggravated and a slight attack of asphyxia, of short duration, occurred. Three days after examination, a severe attack of asphyxia developed, calling for immediate tracheotomy. Laryngoscopic examination showed an infiltrative and erosive process involving the arytenoids, the vocal cords and the vestibule, simulating a malignant growth. However, examination of tissue resected from the right vocal cord showed the characteristic histopathological picture of Lutz's disease. Radiological examinations showed changes in the right lung indicated by a diffuse shadow occupying the entire base, and linear striae radiating from the hilar region and merging in the basal shadow. There was no sign of a destructive lesion. A complete clinical examination did not reveal any other focus of disease in the body but the diagnosis was confirmed by cultivation of *Paracoccidioides brasiliensis* from the sputum.

Under treatment with sulphadiazine, 6 tablets daily to a total of 2,070 tablets, the patient made a complete recovery. After 2 months' treatment, aphonia had disappeared entirely, cough and expectoration were minimal and the tracheotomy tube was dispensed with.

In the second case, the patient, a man aged 32 who had lived in Rio de Janeiro, complained of pain in the right dorsal region and cough with expectoration; this was in 1944. Clinical and radiological examinations led to the bacteriologically unconfirmed diagnosis of pulmonary tuberculosis, for which disease he was placed under treatment. Some time later the larynx

became involved and, from a biopsy specimen, the diagnosis of Lutz's disease was made. Under sulphonamide treatment the pulmonary and laryngeal lesions greatly improved, but scarring, associated with the process of healing of the laryngeal lesions, led to stenosis of the larynx, for the relief of which tracheotomy was performed in 1949. All attempts to dilate the laryngeal constriction were unsuccessful and the tracheal cannula was still necessary in 1951. *J. T. Duncan*

Pope, Hilda & Christison, Isabel. **The Effect of Stilbamidine and Propamidine on the Oxidative Metabolism of** *Blastomyces dermatitidis*. *J. Bacteriology*. 1953, Dec., v. 66, No. 6, 639–41, 1 fig.

" A study was made of the effects of stilbamidine and propamidine on the oxidative metabolism of *Blastomyces dermatitidis*.

" Both drugs inhibited respiration of the organism in the presence of glucose, sodium pyruvate, sodium lactate, sodium oxalacetate, sodium succinate, sodium acetate, DL-alanine, DL-serine, phenylalanine, and methionine.

" The endogenous respiration of the organism was also inhibited.

" A correlation was observed between concentrations of the drugs which inhibited growth and those which inhibited oxygen uptake.

" Stilbamidine was more effective than propamidine in inhibiting growth and respiration of the organism."

MISCELLANEOUS DISEASES

Jelliffe, D. B. & Stuart, K. L. **Acute Toxic Hypoglycaemia in the Vomiting Sickness of Jamaica.** *Brit. Med. J.* 1954, Jan. 9, 75–7, 1 chart.

The authors briefly review the literature on vomiting sickness and draw attention to a fulminant clinical variety. A case report is given in detail. The patient was a Jamaican boy of African extraction who became unconscious some 15 hours after vomiting once. On admission several hours later the child was deeply comatose and had repeated attacks " of stiffening of the limbs, each lasting about one to two minutes, accompanied by rigor-like shaking ". The blood sugar was 19 mgm. per cent. and the liver glycogen, measured at immediate biopsy, only 0·7 per cent. The diagnosis of " acute toxic hypoglycaemia due to vomiting sickness " was made. The rest of the family were unaffected. Adrenaline had no effect on the blood sugar. A dose of 40 gm. glucose in 50 per cent. solution was given intravenously, followed by an intravenous drip of 9·5 per cent. glucose solution. In something over 2 hours the blood glucose concentration reached 700 mgm. per cent. It fell to about 80 mgm. per cent. 4 hours later and remained at that level until death the following day.

Some details are given of 4 similar cases, in which 3 of the patients recovered after large doses of glucose intravenously.

The authors suggest that cases of vomiting sickness should be treated as medical emergencies with intravenous injections of concentrated glucose solution as soon as possible after the onset of symptoms.

B. G. Maegraith

Vaughn, J. **Eosinophils in the Sputum.** *Brit. Med. J.* 1954, Jan. 2, 27–8. [18 refs.]

Several attempts have been made in the past by other workers to relate numerically the eosinophiles in the blood with those in the tissues and fluid discharges but without much success. The author recently described eosinophilic infiltration of the pulmonary tissues of guineapigs following injection of toxic materials (*Blood*, 1953, v. 8, 1). The eosinophiles first increased in the circulating blood, then appeared in the lungs and finally in the respiratory passages. He recently made simultaneous examinations for eosinophiles of blood and sputum of 205 Africans in an area of Tanganyika where the incidence of parasitic infection is high. The results obtained suggest that there is some association between eosinophilia of the blood and that of the sputum. It is suggested that eosinophilia of the sputum and the preceding eosinophilic infiltration of the lungs are integral parts of a general eosinophilia and that the demonstration of eosinophiles in the sputum indicates that a general eosinophilia is or has recently been in progress. *G. R. McRobert*

Deschiens, R. Réponse des hyperéosinophilies à la cortisone en fonction de leur étiologie. [**The Response of Eosinophilia to Cortisone in Relation to Aetiology**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 30/31, 504–6.

The author refers to his work since 1952 on the use of cortisone for the study of tropical and helminthic eosinophilia [this *Bulletin*, 1953, v. 50, 760, 978]. Intramuscular injections of the hormone are given every 2 days for 7 to 15 days, the dose being 50 to 100 mgm. per 60 kgm. weight, a total dose of 350 to 700 mgm. not being exceeded. In this paper the author records the results of this test, and also of the use of ACTH, applied to the following 5 groups of eosinophilia:

(1) *Tropical eosinophilia.*

In 9 patients, whose initial eosinophilia was 30–64 per cent., and the number of eosinophiles between 2,684 and 9,120 per cmm., cortisone treatment lowered, after the 15 days of the test, the percentage of eosinophiles and their number per cmm. to 35 to 90 per cent. of their initial values.

(2) *Helminthic eosinophilia.*

In this group the author treated 13 patients, whose initial eosinophilia was 23 to 61 per cent. and the number of eosinophiles 1,426 to 7,198 per cmm. After the 15 days of the treatment these values proved either irreducible or showed a reduction less than 20 per cent., except in one patient infected with *Trichuris*, in whom the reduction reached 50 per cent. In 2 patients with ankylostomiasis examination of the blood after a single injection of 100 mgm. of cortisone showed a 50 per cent. reduction of the eosinophilia and of the number of eosinophiles. In all the other patients the eosinophilia was not reducible.

(3) *Experimental eosinophilia* of 3 guineapigs, produced by extract of the fluke, *Fasciola hepatica.* These guineapigs had an eosinophilia of 8, 10 and 12 per cent. and cortisone did not reduce it.

The author found congestive and degenerative lesions in the cells of the suprarenal cortices of the animals.

(4) Eosinophilia due to infection of 3 cats with *Toxocara felis.* These 3 cats had eosinophilia of 6, 13 and 14 per cent. which cortisone did not reduce.

(5) Eosinophilia of 2 cats infected with the tapeworm, *Dipylidium caninum*. These cats had eosinophilia of 6 and 12 per cent. In the former cortisone did not reduce the eosinophilia; in the latter the eosinophilia was reduced from 12 to 7 per cent.—a 40 per cent. reduction.

(6) Eosinophilia of 3 guineapigs produced experimentally by capsicum (*piment de Guinée*). These guineapigs had eosinophilia of 19, 10 and 13 per cent. and 5 mgm./kgm. of cortisone given over 15 days reduced their eosinophilia to 11, 6 and 5 per cent. Two guineapigs with eosinophilia of 6 and 7 per cent. were treated with 3 mgm./kgm. of ACTH over 7 days and this reduced the eosinophilia of one to 1 per cent. and that of the other to nil. In these guineapigs the author found medullary congestion and hyperplasia of the reticulated zone of the suprarenal glands.

The author concludes that the cortisone test described, if it is given over a sufficient length of time, discriminates between parasitic and non-parasitic eosinophilia. A single dose of cortisone or ACTH gives results less homogeneous than those given by the treatment described spread over a longer period of time.

G. Lapage

Ramos e Silva, J. Ensaio de tratamento da *Larva migrans* pelo isômero gama. [**Trial of Gammexane in the Treatment of** *Larva migrans*] *Hospital.* Rio de Janeiro. 1952, Dec., v. 42, No. 6, 901–3. English summary.

This is a preliminary note and further trials are called for. The author mentions previous forms of treatment: oil of chenopodium (in 1938), antimonial injections (1947), intravenous Arsenox, Fuadin locally, diethylcarbamazine, 2 mgm. per kgm. thrice daily, but shows from records that none of these has given much satisfaction, the last being the best, with 69 per cent. of cures in 3 weeks. He now uses Gammexane which has given good results in agriculture as an insecticide and in human cases of scabies. It is applied locally as an ointment, 2 per cent. in strength, covered closely with Cellophane, once or twice daily. It proved effective "in about a dozen cases". A 1 per cent. strength has been reported as curing "95 per cent. of 34 cases of scabies after a single dose and 100 per cent. after 3 doses" [abstracter's translation]. The author suggests more trials with a new base, Penetrasol [the composition of which is not given].

H. Harold Scott

Duchen, L. W., Hirsowitz, L. & Murray, J. F. **A Fatal Case of Sarcoma Idiopathicum Haemorrhagicum of Kaposi.** *South African Med. J.* 1953, Nov. 28, v. 27, No. 48, 1078–83, 8 figs.

"A fatal case of Kaposi's haemangiosarcoma in a Bantu male patient is described. The relative rarity of visceral involvement in the Bantu is emphasized."

Pellissier, A. La maladie de Kaposi en Afrique noire (angio-réticulo-endothelio-fibrosarcomatose) à propos de 18 cas. [**Observations on 18 Cases of Kaposi's Disease in Africans**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 832–9, 4 figs. on 2 pls. [12 refs.]

PARASITOLOGY: GENERAL

Belios, G. D. & Cooper, W. **Intestinal Protozoa in Mentally Deficient Children.** *Brit. Med. J.* 1953, Oct. 10, 805–7.

The authors carried out a survey for intestinal protozoa among mentally deficient children, who were inmates of a Hertfordshire hospital and came from the London and Middlesex areas. The stools of 50 boys from 5 to 17 years old were examined by 3 methods: (1) directly in faecal smears (with saline, iodine and eosin); (2) after concentration by a modification of Faust's zinc sulphate flotation technique (*modus operandi* is described in detail); and (3) by cultivation in one of the recognized media. In some cases permanent stained preparations were also made. In the course of these examinations it was shown that a combination of the 3 methods revealed more infections than any single one of them.

The incidence of infection revealed by all these methods was as follows: *Entamoeba coli* 29 (58 per cent.), *E. histolytica* 16 (32 per cent.), *Endolimax* 10 (20 per cent.), *Iodamoeba* 9 (18 per cent.), *Giardia* 7 (14 per cent.), *Chilomastix* 3 (6 per cent.), *Enteromonas* 10 (20 per cent.).

Since in most cases the stools were examined only once, the true incidence of protozoal infections in these children must be higher than indicated by the above figures. Indeed, repeated faecal examinations in 16 children revealed 3 further infections with *E. histolytica*, bringing the incidence for this parasite up to nearly 40 per cent., which is the highest figure recorded for the United Kingdom (the previous figures being from 1·6 to 10 per cent.). However, in the present survey the high incidence of intestinal infections is probably due to close contact between patients with unhygienic personal habits prevailing in mental institutions. *C. A. Hoare*

Seaman, G. R. **Inhibition of the Succinic Dehydrogenase of Parasitic Protozoans by an Arsono and a Phosphono Analog of Succinic Acid.** *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 366–73, 1 fig. [14 refs.]

"The succinate analogs, arsonoacetate and β-phosphonopropionate competitively inhibit the succinic dehydrogenase of the parasitic protozoans, *Trypanosoma cruzi*, *Endamoeba histolytica*, *Trichomonas vaginalis* and *Plasmodium lophurae*.

"The degree of inhibition effected by a given concentration of the arsono or phosphono compound is identical regardless of the organism source of the enzyme. This indicates that the structure of the enzyme is similar in the four protozoans studied."

Lincicome, D. R. **A Streptococcal Decapsulation Test for Detection of Hyaluronidase Activity in Animal Parasites.** *Exper. Parasit.* New York. 1953, Oct., v. 2, No. 4, 333–40, 2 figs. [13 refs.]

It is thought that certain animal parasites at some stage in development may possess an enzyme hyaluronidase which is able to depolymerize the ground substance of connective tissues, namely, hyaluronic acid, and thereby assist in parasite spread. Parasites which might possess such a substance are hookworms, ascarids, amoebae, filariae, or schistosomes [this *Bulletin*, 1953, v. 50, 223] Methods of detecting hyaluronidase have been

described which involve the use of dyes, prevention of clot formation, reduction of viscosity as well as others.

The method described here is based on that described by McClean and others [*J. Path. & Bact.*, 1941, v. 53, 13; 1942, v. 54, 284], who noted that the capsules of young Group A and C streptococci could be caused to disappear by the enzyme. The substrate used in tests was a Lancefield Group C organism grown on tryptose-serum medium. The hyaluronidase was a commercial product prepared from bull testes used in fresh solutions in 0·1 M phosphate buffer at *p*H 6. Combinations of enzyme and substrate in different concentrations were made on films on a microscope slide and incubated at 37°C. for 30 minutes in a moist chamber. At the end of incubation, Indian ink which enabled the capsules to be viewed more easily was added to the film which was fixed by drying in air. Examination was then carried out for evidence of capsular destruction, sometimes with the aid of staining. Only minute quantities of substance are required to show qualitatively the presence of the enzyme and the method described has been successfully applied in the case of filariform larvae of *Ancylostoma caninum* and *Entamoeba histolytica*. *J. D. Fulton*

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Amsterdam. **Transactions of the IXth International Congress of Entomology, Aug. 17–24, 1951. Vol. I. The Congress, Plenary Sessions, Communications at the Sectional Meetings.** pp. lxi + 1115, numerous figs. [Numerous refs.] 1952. **Vol. II. Symposia.** pp. vii + 361, numerous figs. [Numerous refs.] 1953. Amsterdam.

Volume I of these Transactions of the IXth International Congress of Entomology held in Amsterdam in August 1951, is a substantial volume in close print which, besides containing general matters about the organization of the Congress, and lists of delegates and members (with addresses), includes about 230 short scientific papers read before 14 sections. The section on Medical and Veterinary Entomology embraces an interesting variety of subjects. There are papers on the application of one or other of the contact insecticides against mosquito larvae in Malaya (J. A. Reid), mosquito adults in Ecuador (R. Levi-Castillo), bedbugs in Berlin (H. Kemper), and *Culicoides* in Scotland (D. S. Kettle). Problems in the transmission of filariasis are presented with special reference to loiasis (R. M. Gordon) and experimental filariasis in the cotton-rat (D. S. Bertram).

Other articles include a consideration of factors attracting mosquitoes seeking a host (A. W. A. Brown), war-time experiences of malaria in German troops in the Ukraine and Sardinia (P. P. Babiy), various aspects of the action and effects of scorpion sting and spider-bite (A. Shulov), hymenopterous stings (M. Leclercq) and vesicant beetles (J. Théodoridès) on man or experimental animals, and myiasis in Belgium (M. Leclercq). Papers on ticks discuss a new approach to the identification of ixodid species (B. Feldman-Muhsam) and there is a general article on the economic

importance of ixodid and argasid ticks in Africa (H. Hoogstraal). Problems in the control of tsetse fly are discussed with regard to *G. pallidipes* in Kenya (S. G. Wilson). An account of progress in medical entomology in the U.S.A. summarizes past events and future trends in the development of contact insecticides and repellants against mosquitoes, flies, fleas, bedbugs, lice, ticks and mites (E. F. Knipling and F. C. Bishopp).

Other articles, dispersed in other sections, but which have an interest for medical entomologists are an account of an electrical hygrometer for measuring the humidity of micro-climates (E. B. Edney), mosquito activity as observed by 24-hour catches in Africa (P. F. Mattingly), the distribution of species of *Aëdes* (*Stegomyia*) in West Africa (P. F. Mattingly), and the biology and control of blowflies in slaughterhouses in Britain (E. A. Parkin).

Volume II covers fourteen subjects which formed symposia. Readers of this *Bulletin* are most likely to find interest in the series of papers on problems of speciation within the *Culex pipiens* complex (P. F. Mattingly, P. G. Shute, H. Laven, and K. L. Knight) and those on insecticide-resistance in house-flies (J. F. Newman, J. R. Busvine, J. Keiding, R. Pal and M. I. D. Sharma). Other subjects of wide application concerned male genitalia of insects in taxonomy, it being proposed that a glossary of terms might usefully be compiled; problems in zoological nomenclature; experimental aspects of metamorphosis, which largely deals with the rôle of endocrine secretions; and a series of papers on organic phosphorus and systemic insecticides.

The Executive Committee recommended that the next Congress should take place in 1955. *D. S. Bertram*

Haines, T. W. **Breeding Media of Common Flies. I. In Urban Areas.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 933–40. [12 refs.]

"A study of production sources and seasonal abundance of the more common muscoid flies from May 1950 through April 1951 showed that *Musca domestica* was produced by a wide range of breeding media throughout the entire period, far exceeding all other fly species in this respect. This wide adaptability, plus the house fly's enormous reproduction potential, probably accounts for its demonstrated ability to develop insecticide-resistant populations rapidly. The occasional high production of other common species from any one of five principal fly breeding media categories was offset by its relatively infrequent occurrence or its restriction to certain items of breeding material.

"Animal refuse (excrements, pen litter and wastes) not only occurred most frequently of all categories of media examined, but were also the most fly productive breeding materials occurring in the two study towns [in Georgia, U.S.A.]. Fruit-vegetable wastes and miscellaneous wastes were found to occur less frequently and to produce fewer flies, and were considered of secondary importance.

"Species composition of flies counted indoors during the period of this study showed that 99 per cent. were house flies. This species' preference for human association, coupled with its abundance coincidentally with diarrheal disease in the study area, further establishes it as the major species to be considered in this area. Certain other species such as *Phaenicia* spp., *Callitroga macellaria* and *Sarcophaga* spp., while frequently noted in houses, actually comprised less than one per cent of flies in houses."

Tsao, Ching-hsi, Sullivan, W. N. & Hornstein, I. **A Comparison of Evaporation Rates and Toxicity to House Flies of Lindane and Lindane-Chlorinated Polyphenyl Deposits.** *J. Econom. Entom.* 1953, Oct., v. 46, No. 5, 882–4, 1 fig.

"The rate of evaporation of deposits of lindane, chlorinated polyphenyl, and lindane-chlorinated polyphenyl on glass surfaces was determined by periodical weighings of the residues.

"Lindane deposits lost weight rapidly. However, with the addition of an equal part of chlorinated polyphenyl, the rate of lindane evaporation was cut down markedly.

"Chlorinated polyphenyl itself had no toxic effect on house flies (*Musca domestica* (*L.*)), but when incorporated with lindane it increased markedly the residual toxicity of that insecticide. There is some indication that chlorinated polyphenyl may have a synergistic effect with lindane."

Babers, F. H., Pratt, J. J., Jr. & Williams, Michele. **Some Biological Variations between Strains of Resistant and Susceptible House Flies.** *J. Econom. Entom.* 1953, Oct., v. 46, No. 5, 914–15.

"With six susceptible and two resistant strains of house flies, *Musca domestica* L., comparisons were made of egg viability, length of larval life, and number of adult flies obtained from 500 eggs. No differences between strains attributable to resistance were noted. Flies grown under crowded conditions developed into smaller and somewhat weaker insects than those reared normally. However, the smaller insects from a resistant colony grown under crowded conditions were far more resistant than insects from a susceptible strain that were reared under standard conditions."

Kano, R. **Notes on the Flies of Medical Importance in Japan. Part VII. Eggs and Larvae of Stomoxydinae in Japan.** *Japanese J. Exper. Med.* 1953, Apr., v. 23, No. 2, 187–95, 4 figs. [18 refs.]

Basu, B. C., Menon, P. B. & Sen Gupta, C. M. **Cases of Myiasis in Man due to *Oestrus ovis* Linnaeus (Sheep Bot).** *Indian Med. Gaz.* 1953, June, v. 88, No. 6, 321–2.

After observing that no published reports had come to their notice of damage to human health in India from *Oestrus ovis* infestation, the authors discuss the literature briefly.

They then give details of 4 presumptive cases in prisoners in Uttar Pradash, who worked in the wool factory attached to the local gaol. All complained of headache, cough, vomiting, sneezing, nasal discharge, difficulty in breathing and slight fever "after being struck by the flies", one of which was identified as *Oestrus ovis*. Unfortunately, there was no opportunity to search for larvae in the nasal cavities, but the cases coincided exactly with the seasonal incidence of sheep bot in India (October–December). The authors draw the attention of doctors in sheep-rearing areas in India to the possibility of this myiasis occurring in man; with the development of this industry, cases may increase and become a problem for the public health authorities [see also this *Bulletin*, 1953, v. 50, 657].

H. J. O'D. Burke-Gaffney

Durand-Delacre, R. & Mémin, Y. Les phlébotomes des terriers de rongeurs sauvages au Sahara. [*Phlebotomus* **in the Burrows of Wild Rodents in the Sahara**] *Arch. Inst. Pasteur d'Algérie.* 1953, Sept., v. 31, No. 3, 320–33, 2 maps & 4 figs. on 2 pls.

These observations on the haunts of *Phlebotomus* were made during the hot seasons of 1951 and 1952 in the north Sahara at and near Beni Ounif, south of Figuig about longitude 1° W. and latitude 32° N. Investigations had been made in this area on previous occasions [this *Bulletin*, 1949, v. 46 (499)] and so the region and its fauna were not entirely unknown to the present authors. The same method was employed for trapping the sandflies with oiled papers placed near the burrows of rodents.

A very large number of traps were used and 6 species of *Phlebotomus* were obtained, 4 of which bite man and warm-blooded animals; *P. papatasi* which was the commonest, *P. clydei* which was rare, *P. alexandri* 1 male in 1951 and none in 1952, and small numbers of *P. sergenti*. The 2 feeders on cold-blooded animals, such as reptiles, were *P. minutus parroti* and *P. fallax*; these 2 were from burrows in the desert and the plain around Beni Ounif. Males were in the majority and there were very few engorged females. The first appearance of the flies occurs in early May and their disappearance corresponds with the onset of the cold weather at the end of October; these events being of course influenced by meteorological conditions.

On this occasion the burrows and their surroundings were specially studied and many different kinds are described. They are grouped roughly under 2 heads. Those situated near water points, palm groves and gardens where the feeders on man and warm-blooded animals occur; and those in the desert zones more than 3 kilometres from any water point and cultivation.

The most important factor is the orientation of the entrance to the burrow; this may be large or small, shallow or deep, occupied or vacant. If it is occupied, the host may be a mammal, a snake or a lizard and it may stay there regularly, only occasionally or it may finally abandon the place. If the entrance is sheltered from wind and especially if it faces south, it is usually warm inside and the best of these sheltered burrows yielded the greatest numbers of *Phlebotomus* for the longest time.

It was not possible to discover whether these wild rodent burrows were also used for the development of the early stages of *Phlebotomus*.

The area is illustrated by photographs and maps on which the sites of the traps are indicated. *H. S. Leeson*

Shoshina, M. [**The Determination of a Repeated Gonotrophic Cycle in Sandflies**] *Dokl. Akad. Nauk SSSR.* Moscow. (n.s.) 1951, v. 78, No. 1, 181–3, 1 fig. [In Russian.]

O'Rourke, F. J. & Murnaghan, M. F. **Tick Paralysis in the Dog.** [Correspondence.] *Nature.* 1954, Jan. 16, v. 173, 131–2.

Hitherto, attempts to produce tick paralysis experimentally with *Dermacentor andersoni* have been unsuccessful. The present authors, from Ottawa, have now produced it on 7 occasions in long-haired mongrel dogs from Kamloops, British Columbia. Both male and female ticks were applied to the dogs, and the females always produced paralysis. The results are shown below:

Dog No.	1	2	2	3	4	4	4
No. of female ticks feeding	9	1	4	8	1	3	5
No. of days until onset of paralysis ...	6	8	4	7	15	4	2

Except in one case, ticks were removed when paralysis was complete, but before the respiratory muscles were affected. In the first experiment on dog no. 2, paralysis was limited to the fore limbs and recovery was spontaneous; nevertheless, the tick continued to feed and became engorged.

This experiment produces further evidence that the disease due to *D. andersoni* in North America differs from that due to *Ixodes holocyclus* in Australia. In the Australian form, immunity may develop in the dog, but no such immunity occurred in the authors' experiments—indeed dog no. 4 became increasingly susceptible. "Vomition", which is stated to be a characteristic feature of Australian tick paralysis did not occur.

Attempts to transfer paralysis from dog no. 4 when it was moribund, by intravenous blood passage to another dog, were unsuccessful.

H. J. O'D. Burke-Gaffney

Wenk, P. Der Kopf von *Ctenocephalus canis* (Curt.) (Aphaniptera). [**The Head of** *Ctenocephalides canis*] Reprinted from *Zool. Jahrbücher* (Anatomie). 1953, v. 73, No. 1, 103–64, 54 figs. [15 refs.]

This is a thorough work on the morphology of the head of the dog flea in which all organs, including sensory sensillae, are described. Their relationships within the head capsule are set forth in the text and in an unusual wealth of excellent drawings, several of which are perspective in their draughtsmanship. This paper should be consulted by those who are interested in the action of the mouthparts, the mechanism of feeding, or in sensory perception in fleas. There is a useful account of the methods of fixation and staining for sectioned material. *D. S. Bertram*

Jellison, W. L., Locker, Betty & Bacon, Roma. **A Synopsis of North American Fleas, North of Mexico, and Notice of a Supplementary Index.** *J. Parasitology.* 1953, Dec., v. 39, No. 6, 610–18.

Piédrola Gil, G. El descubrimiento del insecticida hexaclorociclohexano. [**The Discovery of the Insecticide Benzene Hexachloride**] *Med. Colonial.* Madrid. 1953, May 1, v. 21, No. 5, 477–94, 2 figs. [15 refs.] *Ibid.*, Aug. 1 & Dec. 1, v. 22, Nos. 2 & 6, 139–61; 560–84, 23 figs. [Numerous refs.]

A review of the subject in Spanish.

Basu, B. C. **Review on DDT and BHC—the Two New Synthetic Insecticides with their Principles and Practices.** *Indian Med. Gaz.* 1953, Mar., v. 88, No. 3, 145–52. [Numerous refs.]

MISCELLANEOUS PAPERS

Rhodesia, Northern. **A Check List of the Mammals of Northern Rhodesia** [Lancaster, D. G.]. pp. vii + 56. [24 refs.] 1953. Lusaka: Govt. Printer. [4s.]

The mammalian fauna of a country may have an important influence on the natural history of parasites affecting human health and welfare. This paper provides a list of over 260 mammals of Northern Rhodesia, arranged systematically in a zoological classification. For the more common species, distribution in the country is indicated by a suitable general term or by

area limits; otherwise place names are given. There is no map in the paper but a gazetteer to about 50 important place names is applicable to any map. The main physical characteristic of the country and certain features recurring frequently in the distributional data are defined. The type species of about 50 of the animals were taken in Northern Rhodesia and a separate list gives the references to the original records. References to 24 general works consulted are adequate although set out in a rather variable manner.

D. S. Bertram

Walker, A. R. Usages pharmaceutiques des plantes spontanées du Gabon. [**Therapeutic Use of the Wild Plants of Gabon**] *Bull. Inst. d'Études Centrafricaines.* (n.s.) 1952, No. 4, 181–6 & 1953, Nos. 5 & 6, 19–40; 275–329.

REPORTS AND SURVEYS

Reboul, E. Le Gourara. Étude historique, géographique et médicale. [**Historical, Geographical and Medical Study of the Gourara, Algeria**] *Arch. Inst. Pasteur d'Algérie.* 1953, June, v. 31, No. 2, 164–246, 11 text figs. & 35 figs. on 16 pls. [Refs. in footnotes.]

This is yet another of the historical, geographical and medical studies of Algerian Sahara *Annexes* that have been published by the Pasteur Institute of Algeria and, like its predecessors it is very informative, well illustrated and interesting.

The Gourara is triangular in shape with its apex to the north extending from 31°30′ to 28°30′ N. It lies on the Greenwich meridian. Its name is derived from *guerara*, a saucer-shaped depression in which rain water collects and persists for some time. This depression is the Sebkha of Timimoun in the south-west angle of the territory. This area, the original Gourara, is the only really habitable part of the vast annexe: here there are very numerous oases. Timimoun is the administrative centre.

An excellent description is given of the people, their manners, customs, occupations, living conditions, dress, beliefs, superstitions, etc. Prior to the French occupation at the beginning of the century the Gourara people had been subjected to repeated invasions, oppression, pillage and division, from time immemorial. Though they live near important caravan routes between the Sudan and Northern Algeria, which were formerly much frequented, the Gourarig still live much as their ancestors did, in green oases just off the beaten track: civilization has passed them by. In spite of the almost total lack of sanitation and personal hygiene, and of extreme poverty, disease prevalence does not appear to be very high—thanks perhaps to the sterilizing action of the sun and to natural selection.

Medical and health activities are controlled from the hospital and dispensary at Timimoun. This was newly installed in stone-built premises in 1950. There are 24 beds in small wards, staffed by 4 male and 3 female, indigenous or half-caste, nurses. Hospital admissions rose from 19 in 1937 to 269 in 1951, and out-patients from 20,175 to 100,000. There are 7 outpost dispensaries in outlying oases staffed by assistant nurses trained in and supervised from Timimoun. Other areas are served by travelling dispensaries.

Malaria is patchy in distribution but is nowhere very severe: none of the spleen or parasite rates recorded is very high. It is a disease of the autumn.

P. falciparum and *P. vivax* appear to be equally prevalent: *P. malariae* is rare. *Anopheles multicolor* and *A. sergenti* are the only two species recorded. From June to November 1951 nivaquine was distributed weekly to 2,000 children in 28 oases by 12 distributing agents: the results are stated to have been good.

Sporadic cases or small outbreaks of louse-borne typhus fever occur from time to time. There was a severe outbreak of louse-borne relapsing fever in 1946, more than 1,000 cases. Neither Oriental sore nor other *Leishmania* infection has ever been recorded. Measles and german measles occur; chickenpox is frequent. Systematic vaccination is eliminating smallpox. No influenza epidemic has occurred since the great outbreak of 1922. Cerebro-spinal meningitis is rare.

Tuberculosis in its many forms occurs but is less prevalent than in more northern areas. In 1951 cutaneous reactions of 598 individuals living in Timimoun or in the neighbourhood of its *sebkha* were positive in 8 per cent. of children and 47 per cent. of adults of white races and in 5·3 per cent. of children and 54·2 per cent. of adults of negroid races.

Neither typhoid fevers nor dysenteries are common. Trachoma is excessively prevalent. Cases of tertiary syphilis are often seen, primary and secondary cases but rarely. Gonorrhoea is widespread. *Ascaris* infestation is very common. Colds and bronchitis are not uncommon in winter but lobar pneumonia is very rare. Acute rheumatism is also very rare. Scorpion bite is a frequent occurrence but rarely produces a fatal result.

Norman White

Lipparoni, E. Un decennio di attività dell'ambulatorio del villaggio Duca degli Abruzzi (Nota 1ª—rilievi statistici—epidemiologici). [**Ten Years Activity of the Villaggio Duca degli Abruzzi Dispensary—Statistical and Epidemiological Data**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Aug., v. 34, No. 8, 408–42. [19 refs.] English summary (5 lines).

The territory in Italian Somaliland which depends on Villaggio Duca degli Abruzzi as its administrative centre covers an area of some 9,000 square kilometres with a population of about 82,000. The medical and health activity of the area is centred in the "A. Cecchi" Hospital in the town. There are 4 outlying medical posts or dispensaries. At the moment the dispensary of the central hospital provides medical care for a rural population of about 30,000. In this paper are set out statistical data concerning the morbid conditions encountered during 10 years' work of this dispensary. Malaria heads the list with 39,037 cases followed by "general medical conditions" 38,431, traumatic lesions 27,529, tropical ulcers 26,270, general surgical conditions 15,849, syphilis 13,317, eye diseases 10,898 and helminth infestations 10,119.

The author gives much information about malaria in the region, nearly all of which is contained in previous publications. Amoebic dysentery, 2,804 laboratory-diagnosed cases, is more prevalent than this figure indicates. Only 2,233 cases of pulmonary tuberculosis were diagnosed but the disease is widespread and probably increasing in prevalence. Bovine tuberculosis is rare. Tuberculin skin reactions in children from villages near headquarters gave a positive reaction in upwards of 70 per cent. No smallpox was notified during the decade. No yellow fever has ever been reported though *Aëdes aegypti* occurs. [An adequate summary of a paper of this description is hardly practicable.]

Norman White

BOOK REVIEWS

Doutressoulle, G. L'Elevage au Soudan Français. Son économie. [**Livestock Breeding and Its Economy in the French Sudan**] [2nd Edition.] 374 pp., numerous illustrations. 1952. Algiers: E. Imbert, 26 rue Hoche.

Doutressoulle, a former Chief Veterinary Inspector and head of the *Service de l'Elevage* in the French Sudan, has in this book combined his own findings on livestock breeding there with those of his colleagues so that it is in effect a compendium of zootechnical knowledge gained in the last 30 years, although, as the author points out in a foreword, information is lacking for large areas of the country and statistics are not exact. The book should be of interest to all concerned with raising the standard of living of nomadic and agricultural peoples without breaking with their traditional way of life, since, in addition to dealing with the background to and importance of livestock rearing, different breeds of animal and the rivalry between agriculturalist and nomadic herdsman, Doutressoulle discusses economic problems, methods of improvement and future development.

The information is clearly set out and the book is abundantly illustrated with photographs, sketches, charts and maps, but is spoilt by indistinct reproduction of some photographs, absence of a map of the whole area and very poor binding which diminishes considerably its value as a work of reference. *John Rathborn*

Blacklock, D. B. [C.M.G., M.D.] & Southwell, T. [D.Sc., Ph.D.]. **A Guide to Human Parasitology for Medical Practitioners.** 5th Edition. Revised by T. H. Davey [O.B.E., M.D.]. pp. viii + 228, 120 figs. & 3 coloured pls. 1953. London: H. K. Lewis & Co. Ltd. [25s.]

This well-known guide to human parasitology maintains its character in the fifth edition, the first to be produced since 1940. Of necessity, revision has had to be extensive, but the treatment of the subject remains the same and the double objective of teaching medical practitioners the nature of parasites and how to diagnose them is kept in the foreground throughout. Professor Davey now adds another feature—the principles of control, which he most concisely gives under three headings for each infection (1) the attack on the parasite itself, by mass chemotherapy, hygienic water supplies, isolation of contacts, etc., (2) the attack on the vector, including also elimination of animal reservoirs, and (3) personal prophylaxis. This addition, bringing the text up to date, and the provision of three excellent coloured plates, are the main changes. The coloured illustration of malaria parasites in a thick film stained by Field's method is unique in giving on either side one column showing staining which is too blue and the other which is too red, with the optimum picture in between. A few lines in small print on the rarer or less important parasites have been added, including Schwetz's observations on *Schistosoma intercalatum*.

The book has its origins in the Liverpool School of Tropical Medicine; it is disappointing therefore that the major discoveries relating to the pathogenesis of malaria made by that School are so briefly related, and a pity that the work of a former member of its staff [Hawking, see this *Bulletin*, 1952, v. 49, 1141; 1953, v. 50, 743] on periodicity of microfilariae is not included in the [otherwise improbable] list of theories attempting to explain the phenomenon.

Although the book is a guide and not a text-book, it covers the subject

adequately. After general introductory and special introductory chapters before each phylum (Protozoa, Platyhelminthes and Nemathelminthes—and the spirochaetes) where definitions and keys for use by a medical practitioner rather than a zoologist are included, each infection is treated systematically under the following headings: geographical distribution, habitat, morphology, life history, pathogenicity (where the disease itself is briefly considered), diagnosis and prevention. Striking diagrams of life histories of helminths are provided in a separate chapter. The last chapter is headed " Congenital Infection and Immunity "; it includes several other unrelated subjects, and to the reviewer it would seem that the contents of this chapter would be better incorporated in earlier ones. It is difficult to understand why *Sarcocystis* is described and *Toxoplasma*—a much more important human organism—is not mentioned; also if there has to be a chapter on the spirochaetes why is there not one on rickettsiae? Probably both would be better omitted. Concentration methods for helminth eggs are given, but not for protozoa.

These are minor criticisms, and there is no doubt that the book will appeal strongly to the practical man who has not time to study the subject in detail. He will find all the major points here—not altogether surprisingly, considering who the authors are—men who know the tropics well enough to state that " in the tropics every action involving additional trouble is an effort ". *P. C. C. Garnham*

NOTICE

ROSS INSTITUTE OF TROPICAL HYGIENE

Lay Course in Tropical Hygiene

To be held from 26th to 30th July, 1954

The course deals with malaria and its control and other tropical diseases and problems. It is intended for estate and mine managers and their assistants, missionaries and all whose work in the tropics concerns the health and welfare of others. Senior men will find the course of particular value owing to the many developments in knowledge of these subjects which have taken place in recent years.

There is no fee for the course.

It would be appreciated if agencies and firms would inform their managers and assistants that this course is being organised and encourage and assist them to attend.

Further information on the detailed arrangements will be sent to those who have enrolled about a month prior to the date of the course.

Further details may be obtained from:—L. G. Ponsford, Esq., *Organising Secretary*, Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London, W.C.1.

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